BURY ROCHDALE AND OLDHAM STRATEGIC FLOOD RISK ASSESSMENT

VOLUME I – SFRA User Guide

December 2009

FINAL REPORT

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Structure of the Bury, Rochdale and Oldham SFRA

The Bury, Rochdale and Oldham SFRA is supplied as four Volumes, described in the table below. Readers should refer to Volume I: SFRA User Guide for guidance on how to use the information provided in the SFRA.

SFRA Volume	Title of volume	Contents
I	User Guide	The BRO SFRA Volume I has been developed to provide guidance on the use of the SFRA for Local Authority Spatial Planning, Regeneration, Development Management and Emergency Planning officers and Developers.
II	Level 1 SFRA	The BRO SFRA Volume II has used mostly existing data to make an assessment of flood risk from all sources now and in the future and builds on the Association of Greater Manchester Authorities (AGMA) Sub-Regional SFRA. It provides evidence for LPA officers to apply the Sequential Test and identifies the need to pass the Exception Test where required.
III	Level 2 SFRA	The BRO SFRA Volume III provides evidence on a key community basis where the Exception Test may need to be applied. It considers the detailed nature of flood hazard taking account of the presence of flood risk management measures such as flood defences. The additional detail can also inform a sequential approach to development allocation within flood risk areas and mitigation options where appropriate.
IV	Rochdale Preliminary Mitigation Review	The BRO SFRA Volume IV provides a preliminary review of mitigation options for delivering regeneration for sites that are part of the East Central Rochdale Pathfinder Housing Market Renewal and Town Centre East initiatives.

REVISION HISTORY

Revision Ref./ Date Issued	Amendments	Issued to
Draft Report 3rd July 2009		Bury MBC (David Hodcroft) Rochdale MBC (Francis Comyn) Rochdale Development Agency (Richard Duddell) Oldham Council (Georgina Brownridge) Environment Agency (Chris Waring) Digital copy
Draft Final Report 27th August 2009	LPA and EA Comments	Bury MBC (David Hodcroft) Rochdale MBC (Francis Comyn) Rochdale Development Agency (Richard Duddell) Oldham Council (Georgina Brownridge) Environment Agency (Chris Waring) Digital copy
Draft Final Report 30th October 2009	LPA and EA Comments	Bury MBC (David Hodcroft) Rochdale MBC (Francis Comyn) Rochdale Development Agency (Richard Duddell) Oldham Council (Georgina Brownridge) Environment Agency (Chris Waring) Digital copy
Final Report 23rd December 2009	LPA and EA Comments	Bury MBC (David Hodcroft) Rochdale MBC (Francis Comyn) Rochdale Development Agency (Richard Duddell) Oldham Council (Georgina Brownridge) Environment Agency (Chris Waring) Digital and printed copies

CONTRACT

This report describes work commissioned by Bury, Rochdale and Oldham Council's under Contract Number 918-701 of 03/03/2009. The Client's representative for the contract was Francis Comyn. Chris Isherwood and Hannah O'Callaghan of JBA Consulting carried out the work.

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PURPOSE

This document has been prepared solely as an SFRA User Guide for Bury MBC, Rochdale MBC and Oldham Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

ACKNOWLEDGMENTS

JBA would like to acknowledge the support of Housing Market Renewal (HMR) and the SFRA steering group Francis Comyn (Rochdale MBC), David Hodcroft (Bury MBC), Pauline Goodhall and Georgina Brownridge (Oldham Council), Richard Duddell and Janet Brooks (Rochdale Development Agency) and Chris Waring and Andy Cameron (Environment Agency).

EXECUTIVE SUMMARY

Introduction

Bury, Rochdale and Oldham (BRO) Councils are required to undertake a Strategic Flood Risk Assessment (SFRA) as an essential part of the pre-production/evidence gathering stage of the Local Development Framework (LDF) and in preparing their Local Development Documents (LDDs). The SFRA provides baseline information for use in the preparation of the Sustainability Appraisal (SA) of LDDs for the scoping and evaluation stages.

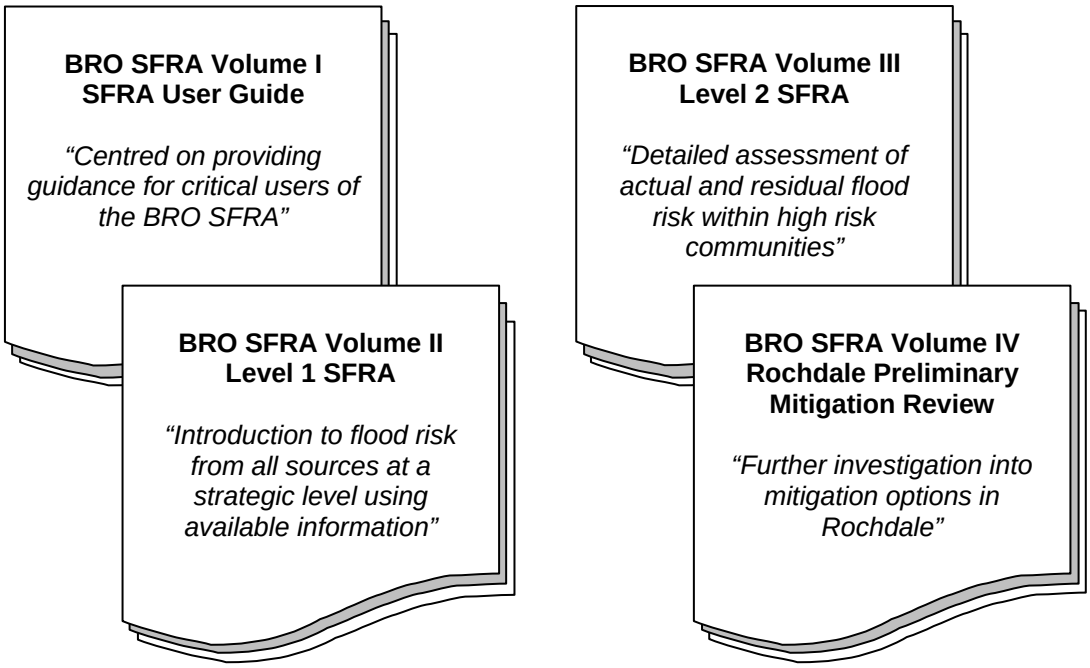
The requirement for and guidance on the preparation of SFRAs is outlined in Planning Policy Statement 25 Development and Flood Risk (PPS25) and its Practice Guide. This requires Local Planning Authorities (LPAs) to take a more dominant role in local flood risk management. They also need to demonstrate that due regard has been given to the issue of flood risk at all levels of the planning process to avoid inappropriate development.

Local authority planners must demonstrate that a risk based, sequential approach has been applied in preparing development plans and that flood risk has been considered during the planning application process. This must be achieved through the application of the Sequential and Exception Test as outlined in PPS25.

By providing a central store for data, guidance and recommendations on flood risk issues at a local level, the SFRA is an important planning tool that enables the LPA to carry out the Sequential and Exception Test and to select and develop sustainable site allocations with regard to flood risk.

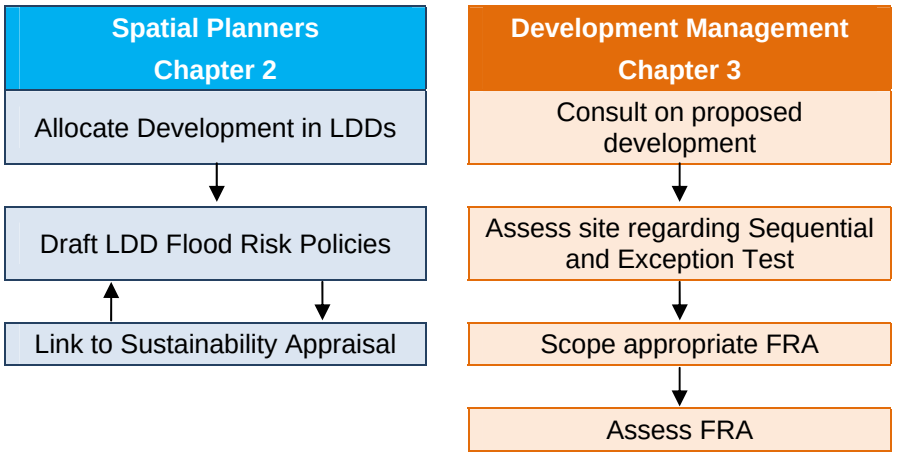
SFRAs can also provide a much broader and inclusive vehicle for integrated, strategic and local Flood Risk Management (FRM) assessment and delivery, by providing the linkage between Catchment Flood Management Plans (CFMPs), Regional Flood Risk Appraisals (RFRAs) and Surface Water Management Plans (SWMPs). The suite of flood risk policy issues and information on the scale and nature of the risks in these various documents needs to be brought into "real" settings with the SFRA tasked with improving the understanding of flood risk across the districts.

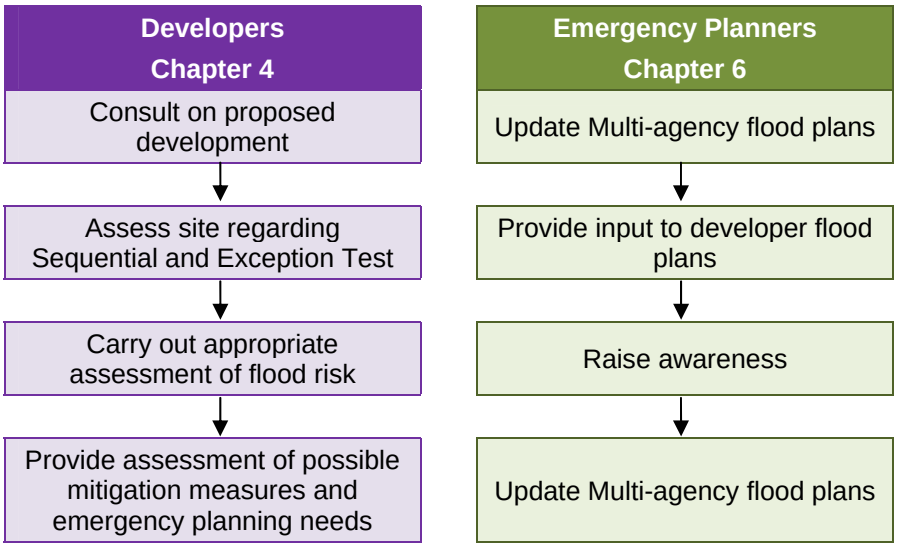
The Bury, Rochdale and Oldham (BRO) Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA) are presented across four separate report Volumes and are referred to as the 'BRO SFRA Volumes I, II, III and IV' throughout this User Guide:



SFRA User Guide

The BRO SFRA Volume I (User Guide) has been developed to provide specific guidance for SFRA users and should be the first point of call when using the BRO SFRA. Each User specific section links to the evidence provided in the BRO SFRA Volume II and Volume III and their associated mapping.





BRO SFRA Mapping

The BRO SFRA Volume II and III have produced a suite of strategic flood risk maps. These maps should be used to guide development away from high flood risk areas in conjunction with the guidance in PPS25 and its Practice Guide and the guidance provided in the BRO SFRA Volume I (this document).

Future identified development sites should also use the suite of strategic flood risk maps produced along with any additional updated data available at the time from the relevant LPA and the Environment Agency.

Below is a complete list of maps produced in the BRO SFRA Volume II and III.

Map Name	Map Reference	SFRA Reference
Sequential Spreadsheet Results	**Volume II Map 1.1 A-C**	**Volume II section 4.0**

These maps provide the results of the analysis of council development sites against the flood zones. This map should be used as a high level identification of proposed development sites at risk. It highlights those sites that are within Flood Zone 3b (red), 3a (orange), 2 (yellow) and 1 (green). This map is particularly useful for Spatial Planners.

Flood Zones (FZ)	**Volume II Map 1.2 A-O**	**Volume II section 2.2 and 3.2**

These maps show Environment Agency Flood Zones 3b, 3a, 2, 1 and proposed development allocations. This map should be used to facilitate the application of the Sequential Test by Spatial Planners and Development Management officers. See section 2 and 3 for more guidance.

Flood Zone 3 Depth Grid	**Volume II Map 1.6 A-O**	**Volume II section 3.6**

A strategic depth grid has been created using the extent of Flood Zone 3 and topographic data. These maps should provide an early identification of the variation of risk throughout the Flood Zone. Users should refer to Maps 2.1 to 2.16 from the BRO SFRA Volume III for detailed model depths and hazards where available.

Holcombe Brook Revised FZ	**Volume II Map 1.2 P**	**Volume II section 3.0**

The 1 in 100 year (Flood Zone 3) and 1 in 1000 year (Flood Zone 2) flood events were rerun along Holcombe Brook using the original broad scale modelling methodology but incorporating LiDAR data instead of NEXTMAP. Whilst the current Flood Zones published by the Environment Agency should be used when carrying out the Sequential Test along the Roch, this map should provide an indication of actual risk. It is likely that the Flood Zones will be updated to resemble these extents once the Environment Agency undertakes their own review.

River Roch Revised FZ	**Volume II Map 1.2 Q**	**Volume II section 3.0**

The 1 in 100 year (Flood Zone 3) and 1 in 1000 year (Flood Zone 2) flood events were rerun along the River Roch using the detailed 1D-2D model developed for the BRO Level 2 SFRA. These models also included hydrology updated by the Environment Agency during the River Roch Review in 2008. Whilst the current Flood Zones published by the Environment Agency should be used when carrying out the Sequential Test along the Roch, this map should provide an indication of actual risk. It is likely that the Flood Zones will be updated to resemble these extents once the Environment Agency undertakes their own review.

Flood Risk Management	**Volume II Map 1.3 A-O**	**Volume II section 2.9, 2.11, 3.3**

These maps provides the location of current Flood Risk Management (FRM) Measures within the study area including defences, areas benefiting from defences (1 in 100 year standard of protection) and, Environment Agency Flood Warning Areas. This map can be used to identify communities currently protected. Proposed development in these locations will still be subject to residual risk and should refer to detailed breach and overtopping assessments carried out in the BRO SFRA Volume III.

Surface Water Flooding	**Volume II Map 1.4 A-O**	**Volume II section 2.3 and 3.4**

These maps have been produced from the Environment Agency Areas Susceptible to Surface Water Flooding Map. Users will need to refer to Environment Agency guidance document issued on its applicability. Surface water flooding has been classified as high, medium and low susceptibility. This map has been used within the BRO SFRA Volume II to help identify Critical Drainage Areas (See Volume II

section 5.3.1). These areas have been further assessed in the BRO SFRA Volume III section 5.0. This map should be used during the Sequential Test and during scoping of individual FRAs.

Climate Change Sensitivity	**Volume II Map 1.5 A-K**	**Volume II section 2.12 and 3.5** **Volume III section 3.0**

These maps have been produced using information from the Greater Manchester sub-regional SFRA and updated using detailed model outputs created during the BRO SFRA Volume III. They should be used as an early indication of areas in which fluvial flooding may significantly increase over the next 100 years. These maps are useful when making an assessment of sites that may require the Exception Test by Spatial Planners, Development Management and developers. Emergency planners may also find them useful while designating access and egress routes.

Critical Drainage Areas	**Volume I Map 1.7 A-D**	**Volume III section 5.0**

These maps have been produced showing the boundary of Critical Drainage Areas based on known historical flood events, natural catchment boundaries and the Environment Agency national Areas Susceptible to Surface Water Flooding map. They do not take into account sewered catchments. These maps should be used to scope site-specific FRAs and as a starting point in the identification of areas for SWMPs

Refined Surface Water	**Volume III Map 1.1 to 1.6**	**Volume III section 5.0**

These maps have been produced for CDAs following the recommendations in the BRO SFRA Volume II section 5.3.1. They have been produced using the same methodology as the national Areas Susceptible to Surface Water Flooding maps. However LiDAR data has been used which was then edited to include flow paths and buildings. These maps should be used during the Sequential and Exception Test and scoping of a site-specific FRA. They should also be used during the master planning and the sequential approach to site layout.

Fluvial Depth	**Volume III Map 2.1 – 2.16**	**Volume III section 3.0**
Fluvial Hazards	**Volume III Map 3.1 – 3.16**	**Volume III section 3.0**

These maps have been produced using detailed Environment Agency 1D hydraulic rivers models and strategic 2D floodplain models created in Ramsbottom, Bury-Radcliffe, Rochdale and Littleborough. They identify both depths and hazards during the 1 in 100 year and 1 in 1000 year fluvial flood events. Outputs have also been produced including the impact of climate change. Defences are included in the model, so should identify areas benefitting from 1 in 100 year SOP or greater defences. The output should also identify defences which are overtopped during the extreme 1 in 100 year event or where defences are bypassed.

The hazards maps have been produced as a function of flood depth, flood velocity and a debris factor. Flood hazards are categorised as ***No Hazard, Very Low Hazard, Dangerous for some, Dangerous for most and Dangerous for all.***

Animations have been produced for the 1 in 100 year and 1 in 1000 year fluvial events. These can be used to identify rapid inundation zones, the development of flow paths, and indicative inundation timing. These are provided in the SFRA digital deliverables.

As the outputs have been produced using a 2D model to represent the floodplain, the outputs will also identify critical flood paths along roads and around buildings once flood water enters the urban environment. These maps should be used during the Sequential Test and provide the evidence to inform the likelihood of sites passing the Exception Test. Sites situated in communities with high depths and/or hazards should be avoided and would find it difficult the pass the Exception Test. Emergency planners may also find this useful in designating access and egress routes.

Breach Depths	**Volume III Map 4.1 and 4.3**	**Volume III section 3.0**
Breach Hazards	**Volume III Map 4.2 and 4.4**	**Volume III section 3.0**

Following the production of an asset survey, a breach assessment was investigated at the upstream extent of the Esplanade Culvert, Rochdale town centre, on the right hand bank during the 1 in 100 year event. The effect of climate change has also been investigated. Both depths and hazards have been mapped. Currently the defence along this reach is in poor condition and consists of an earth embankment.

Development in the vicinity of this defence should investigate the residual risk further during a site-specific FRA.

Canal Hazard Zone	Volume III Map 5.1 and 5.2	Volume III section 4.0

A Direct Canal Hazard Zone has been created, based on professional judgement, of potential areas which could flood if the Rochdale or Manchester, Bury and Bolton Canal were to overtop or breach. This hazard zone should not influence the spatial planning of development during the Sequential Test but should trigger the need to investigate the residual risk further during any FRA within the zone.

An Indirect Canal Hazard Zone was created for Rochdale by modelling the effect of a possible canal breach in Littleborough and East Rochdale during a 1 in 100 year fluvial flood event. The impact on increased maximum water levels in the River Roch was also assessed in the BRO SFRA Volume III section 4.3. This hazard zone should influence the spatial placement of development during the Sequential Test, especially when considering the substitution of vulnerable development, when taking into account other sources of flood risk.

Both of these zones provide an indication of the residual risk or 'hazard' should the canal overtop or breach. It is recommended that detailed investigations should be carried out and results incorporated into the final design finished floor levels of the development. Site emergency plans should also take the residual risk into account.

Flooding from Multiple Sources	Volume III Map 6.1 – 6.3	Volume III section 6.0

The flooding from multiple sources map is a summary of those areas at highest risk of flooding. It includes fluvial, surface water and canal hazard and highlights those areas that are at risk from all three, two or just one source.

This map could be used during the Sequential Test when considering the sources of flooding or to identify the likelihood of passing the Exception Test. Areas or communities at risk from more then one source of flooding could require significant mitigation measures and SUDS, which could potentially require large areas of land within the development site.

Use of SFRA Data

Whilst all data collected and produced during the BRO SFRA process has been supplied to each LPA (report, maps, GIS, modelled output) there should be controls on its use. It is anticipated that the SFRA report (all Volumes) and associated maps will be published on each Council website as PDFs as the central source of SFRA data and available to download.

Each LPA will be able to use the modelled output (depths, hazards and outlines) for internal use. This use of this information must consider the context within which it was produced. The use of this data will fall under the license agreement between the LPA and the Environment Agency as it has been produced using Environment Agency data. It should be remembered that the modelling undertaken for the SFRA is of a strategic nature and more detailed FRAs should seek to refine the understanding of flood risk from all sources to any particular site.

SFRA data should **not** be passed on to third parties outside of the LPA. Any third party wishing to use existing Environment Agency flood risk datasets should contact External Relations in the Environment Agency North West Region. A charge is likely to apply for the use of this data.

CONTENTS

APPENDICES:

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

ABD	Areas Benefiting from Defences
AEP	Annual Exceedance Probability
AGMA	Association of Greater Manchester Authorities
BRO	Bury, Rochdale and Oldham Councils
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plans
CLG	Communities and Local Government
COW	Critical Ordinary Watercourse
CS	Core Strategy
DPDs	Development Plan Documents
EA	Environment Agency
EU	European Union
FAS	Flood Alleviation Schemes
FEH	Flood Estimation Handbook
FCERM	Flood and Coastal Erosion Risk Management
FRA	Flood Risk Assessment
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
GMRF	Greater Manchester Resilience Forum
IFM	Indicative Floodplain Map
LDDs	Local Development Documents
LDF	Local Development Framework
LPAs	Local Planning Authorities
MIR	Modelling Inception Report
NFCDD	National Fluvial and Coastal Defence Database
NPD	National Property Dataset
PFRA	Preliminary Flood Risk Assessment
PG	Practice Guide
PPG	Planning Policy Guidance
PPS	Planning Policy Statement
RBD	River Basin District
RBMP	River Basin Management Plan
RFRA	Regional Flood Risk Assessment
RPB	Regional Planning Bodies
RPG	Regional Planning Guidance
RSS	Regional Spatial Strategy
RVFD	Receptors Vulnerable to Flooding Database
SA	Sustainability Appraisal
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SFVI	Social Flood Vulnerability Index
SOP	Standard of Protection
SPD	Supplementary Planning Document
SUDS	Sustainable (Urban) Drainage Systems
SWMP	Surface Water Management Plan
UDP	Unitary Development Plan
UKCIP	United Kingdom Climate Impacts Programme
UKCP	United Kingdom Climate Projections
UU	United Utilities

1 INTRODUCTION

1.1 Background

JBA Consulting was commissioned in March 2009 by Bury MBC, Rochdale MBC and Oldham Council to undertake a Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA) leading on from the Greater Manchester Sub-Regional SFRA completed in August 2008[1].

The Level 1 (Volume II) and Level 2 SFRA (Volume III) for Bury, Rochdale and Oldham (BRO) has been prepared in accordance with current best practice, Planning Policy Statement 25 *Development and Flood Risk* (PPS25)[2] and the PPS25 Practice Guide[3].

1.1.1 Flood Risk Assessment

Flooding is a natural process and does not respect political demarcations or administrative boundaries; it is influenced principally by natural elements of rainfall, tides, geology, topography, rivers and streams and man made interventions such as flood defences, roads, buildings, sewers and other infrastructure. As was seen in the summer 2007 floods, flooding can cause massive disruption to communities, damage to property and possessions and even loss of life. Flood risk concepts are explored further in **Appendix A**. The risk of flooding from rivers, surface water, sewers, groundwater, canals and reservoirs has been explored for Bury, Rochdale and Oldham as part of this SFRA.

For this reason it is important to avoid developing in flood risk areas in the first instance. Where this is not possible development should be directed to areas with the lowest possible level of flood risk. Having exhausted all opportunities to direct development away from areas of flood risk then the allocation of land for development must consider the vulnerability of the proposed land use to flooding and take measures to minimise flood risk to people, property and the environment. This is the thrust of the risk based sequential approach to managing flood risk and it is the backbone of PPS25.

Current Government policy requires local authorities to demonstrate that due regard has been given to the issue of flood risk as part of the planning process. It also requires that flood risk is managed in an effective and sustainable manner and where new development is as an exception necessary in flood risk areas, the policy aim is to make it safe without increasing flood risk elsewhere and wherever possible reduce flood risk overall.

The SFRA fits into a hierarchy of Flood Risk Assessments, each at an increasing level of detail that are designed to inform different stages of the planning system, from Regional Spatial Strategies to site specific Planning Applications. More background on this is provided in **Appendix B**.

1.1.2 The Planning Framework

The land use planning process is driven by a whole host of policy guidance on a national, regional and local level. Whilst the majority of these policies are not aimed at mitigating flood risk, there are key links at strategic, tactical and operational levels between land use and spatial planning (Regional and Local Government), and Flood Risk Management (FRM) planning (Environment Agency), which should be considered as part of a planned and integrated approach to delivering sustainable development. Table 1-1 lists relevant legislation, plans, policies and strategies. More detail on these is provided in **Appendix C**.

[1] AGMA (2008) *Greater Manchester Sub-Regional SFRA*

[2] Communities and Local Government (2006) *Planning Policy Statement 25: Development and Flood Risk*

[3] Communities and Local Government (2009) *Planning Policy Statement 25: Development and Flood Risk – Practice Guide*

Table 1-1: Relevant Legislation, Plans, Policies and Strategies as at October 2009

Flood risk	Planning
National level	
• EU Floods Directive – EU (2007) • Flood Risk Regulations (2009) • Draft Flood and Water Management Bill – Defra (2009) • Future Water – Defra (2008) • Improving Surface Water Drainage – Defra (2008) • Making Space for Water – Defra (2005) • Learning Lessons from the 2007 Floods – Sir Michael Pitt (2008)	• Planning Policy 25: Development and Flood Risk – DCLG (2006) • Planning Policy 25: Development and Flood Risk Practice Guide – DCLG (2009) • PPS1 Delivering Sustainable Development – ODPM (2005) • Planning Policy Statement: Planning and Climate Change, supplement to PPS1 – DCLG (2007)
Regional level	
• River Irwell Catchment Flood Management Plan – Environment Agency (2008) • North West Regional Flood Risk Appraisal – 4NW (2008) • Greater Manchester sub-regional SFRA – AGMA (2008)	• North West Regional Spatial Strategy – Government Office for the North West (2008) • North West River Basin Management Plan – Environment Agency (2008)
Local level	
• Flood risk assessments for development sites (referred to as necessary in SFRA volumes)	• Emerging Local Development Frameworks for Bury, Rochdale and Oldham • Existing UDPs for Bury, Rochdale and Oldham
All legislation, plans, policies and strategies were relevant as at October 2009	

1.2 Development of the SFRA

A Steering Group was set up for the SFRA, comprising of key officers from Rochdale, Bury and Oldham Councils, Rochdale Development Agency (RDA) and the Environment Agency (EA). British Waterways and United Utilities were consulting during the development of the SFRA. More information on stakeholder engagement and data management is provided in **Appendix D**.

The Bury, Rochdale and Oldham (BRO) Level 1 and Level 2 Strategic Flood Risk Assessments (SFRA) are provided within four volumes:

- **Volume I – SFRA User Guide**
- **Volume II – Level 1 SFRA**
- **Volume III – Level 2 SFRA**
- **Volume IV – Rochdale Preliminary Mitigation Review**

1.2.1 Volume I BRO SFRA User Guide

This volume has been developed to provide guidance on the use of the SFRA for Local Authority Spatial Planning, Regeneration, Development Management and Emergency Planning officers and Developers.

1.2.2 Volume II BRO Level 1 SFRA

The BRO SFRA Volume II has used mostly existing data to make an assessment of flood risk from all sources now and in the future and builds on the Association of Greater Manchester Authorities (AGMA) Sub-Regional SFRA. It provides evidence for LPA officers to apply the Sequential Test and identifies the need to pass the Exception Test where required. Both of these tests are a fundamental part of PPS25.

The study area focuses on Bury, Rochdale and Oldham Council and key urban areas; including Ramsbottom, Bury, Radcliffe, Littleborough, Rochdale and Shaw. Although Oldham Council has been included in the discussion, only areas within the River Beal catchment have been assessed as part of this SFRA. Oldham Council are preparing a separate SFRA that will cover all of Oldham, including the Beal catchment. The main tasks for the BRO SFRA Volume II included:

- Stakeholder consultation, data collection and review
- Assessment of current flood risk
- Delineation of PPS25 Flood Zones including the Functional Floodplain and the impact of climate change
- Assessing flood risk from 'other' sources including surface water, groundwater, sewers, reservoirs and canals
- Assessing potential development sites
- Producing a range of strategic flood risk maps
- SFRA recommendations

1.2.3 Volume III BRO Level 2 SFRA

The BRO SFRA Volume III provides evidence on a key community basis where the Exception Test may need to be applied. It considers the detailed nature of flood hazard taking account of the presence of flood risk management measures such as flood defences. The additional detail can also inform a sequential approach to development allocation within flood risk areas and mitigation options where appropriate.

The study area focuses on Bury, Rochdale and the Beal catchment within Oldham and key urban areas including Ramsbottom, Bury, Radcliffe, Littleborough, Rochdale and Shaw. The risk of fluvial flooding to development sites in Oldham Council was not considered to be high and there was also no planned development identified behind flood defences. A detailed Level 2 assessment was therefore not undertaken for all sources of flood risk in Oldham. The main tasks for the BRO SFRA Volume III included:

- Defence Asset Survey – carrying out a defence asset investigation in key areas of Bury and Rochdale, photographs were taken and visual inspection of the defence assets condition and supplementary comments were made. The outputs from this survey were used to focus the more detailed investigations discussed below
- Development of detailed 1D-2D hydraulic river models along the River Irwell and Roch in key development locations
- Production of fluvial depth and hazard maps for a range of scenarios including breaching, overtopping and the impacts of climate change
- Detailed surface water flooding maps
- Assessment and modelling of residual risks associated with canals
- Assessment of the consequences of upstream development
- Producing an outline mitigation strategy for Rochdale and Bury
- Maintenance recommendations for Rochdale and Bury
- Recommendations for future work

1.2.4 Volume IV Rochdale Preliminary Mitigation Review

Rochdale MBC commissioned a preliminary review of mitigation options for delivering regeneration for sites that are part of the East Central Rochdale Pathfinder Housing Market Renewal and Town Centre East initiatives. This has involved considering the viability of mitigation options, in light of constraints including costs and land availability and investigating different routes to delivering development.

1.3 SFRA Monitoring and Review

Whilst the BRO SFRA has been produced using the most up-to-date national guidance and flood risk data, it is recommended that the SFRA should be updated on a regular basis. The Environment Agency has suggested that this be every 3 to 4 years, unless there is a significant flood affecting the area, leading to new information on areas at flood risk becoming available. A review of the SFRA should also be undertaken if there are any major national policy changes.

There are a number of outputs and datasets which are known to be regularly updated. These should be incorporated in any update to the SFRA. Table 1-2 contains a list of SFRA review triggers.

Table 1-2: SFRA review triggers

Trigger	Source	Possible Timescale
Irwell and Upper Mersey CFMP	Environment Agency	Updated every 5 years
Flood Zones – significant change	Environment Agency	Updated quarterly
NFCDD	Environment Agency	Ongoing
Possible Flood Event	All	Unknown
Sewer Flood Data	United Utilities	Late 2009, but not made available in time for the Level 1 and Level 2 SFRAs
Greater Manchester Multi-Agency Flood Plan	GM Resilience	Ongoing
Planning Policy	CLG	Unknown
Surface Water Management Plans	LPA	On completion

2 GUIDANCE FOR SPATIAL PLANNERS

The aim of this section is to provide guidance on the use of the SFRA in Spatial Planning. Planners should also refer to the guidance on SFRA maps provided on page vi and background to the SFRA and flood risk concepts in Appendix A and C.

Spatial Planners should use the guidance in this SFRA User Guide, and where necessary PPS25 and its Practice Guide to:

- ***Scope the Sustainability Appraisal of the Core Strategy***
    - *Screen development options*
    - *Produce appropriate flood risk indicators*
- ***Avoid strategic sites at high risk of flooding where no other planning objectives outweigh flood risk***
    - *Using Sustainability Appraisal and Sequential Test Spreadsheet*
- ***Carry out the Sequential Test on proposed development sites***
    - *Using information provided in the BRO Level 1 SFRA (Volume II) and Sequential Test Spreadsheet to avoid sites at high risk*
- ***Identify those sites where a greater understanding of flood risk is required***
    - *These should include key development sites at high risk of flooding*
- ***Identify the likelihood of sites passing the Exception Test***
    - *Using the Sustainability Appraisal to assess development sites with regards to other planning objectives and assign weight given to flood risk as an environmental constraint*
    - *Using information provided in the BRO Level 2 SFRA (Volume III) to assess level of risk to each site and likelihood of it remaining safe. If a site cannot pass all the criteria of the Exception Test it cannot be approved.*
- ***Allocate appropriate development through the Sustainability Appraisal***
    - *Produce evidence that both tests have been applied by noting the outcome and decisions made to avoid, substitute or allocate the site*
- ***Draft flood risk policies and develop guidance on each allocated site within the Sustainability Appraisal***
    - *Guidance should include the need for site-specific FRAs to pass Part C) of the Exception Test*

2.1 Introduction

PPS25 provides the basis for the sequential approach, in which its policies require that the LPA consider flood risk, its mechanisms, spatial distributions and development vulnerability in all stages of the development planning process.

PPS25 promotes positive planning to deliver strategic opportunities to reduce flood risk to communities and apply the Government's policy on flood risk management. The Practice Guide also provides further advice on how flood risk should be taken into account in the LDF (See **section 2.20-2.24** of **PPS25 Practice Guide**).

Throughout the risk based sequential approach, management actions to avoid, substitute, control and mitigate flood risk should always be kept in mind and opportunities taken to minimise flood risk at every stage of the planning process. The principal aim of these actions is to ensure that flood risk to people, their property and the environment is reduced to acceptable levels.

The hierarchy of management decisions and actions include:

- **Avoidance** by locating new development outside areas at risk of flooding,
- **Substitution** by changing from a more to a less vulnerable land use, and
- **Control and Mitigation** of the risks by implementing flood risk management measures through a variety of techniques to reduce the impact and mitigate residual risks.

The sequential approach is achieved through the **successive** application of the Sequential Test and Exception Test. Both the BRO SFRA Volume II and III provide the evidence base for this decision making process and should form part of the baseline information for the Sustainability Appraisal of LDDs during the scoping and evaluation stages.

The BRO SFRA provides the relevant information on flood risk to allow the LPA to:

- Produce appropriate policies for the allocation of sites and development control which avoids flood risk to people and property,
- Produce appropriate flood risk indicators to inform the Sustainability Appraisal,
- Undertake the Sequential Test and Exception Test, and
- Allocate appropriate land use through the Sustainability Appraisal.

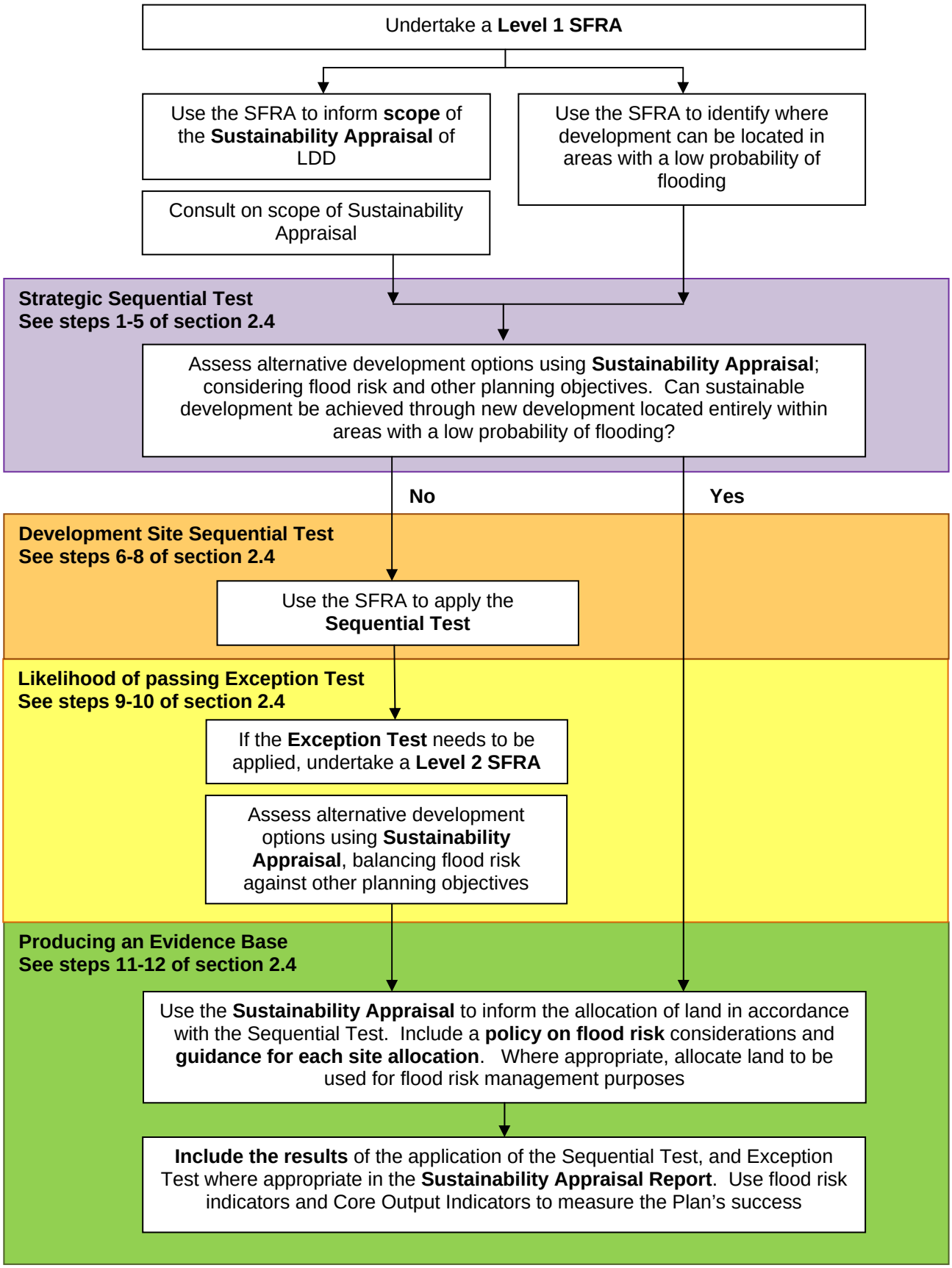
The BRO SFRA Volume III also provides information to allow planners to make strategic decisions that identify the amount and type of development that may be suitable in the community and the reality of it remaining safe from flooding if allocated. It also identifies potential strategic mitigation strategies that may be required for development to be feasible in the area.

Figure 2-1 illustrates the accountability of flood risk within LDDs and the use of SFRA information. The flow diagram has been adapted from PPS25 Practice Guide (Figure 2.4 p.18) to link in with guidance provided within this User Guide.

Each colour represents a key stage in the sequential approach process. Identical colours are used throughout this Chapter to make it easier to identify what guidance relates to individual steps within the sequential approach sequence.

It must be acknowledged that Figure 2-1 is a generic flow diagram, with each LPA likely to be at different stages of its LDD process. It is more likely that the LPA may have produced a Core Strategy prior to undertaking the Sequential Test with the benefit of the data in this SFRA or are preparing their LDDs and allocating development. PPS25 Practice Guide assumes a strong link with the Sustainability Appraisal, and the SFRA influences all stages of the Sustainability Appraisal. Therefore the generic flow diagram in both PPS25 Practice Guide and this User Guide should be amended to take account of steps which may have previously been taken within the first pass of the Sustainability Appraisal stage.

Figure 2-1: Taking flood risk into account in LDDs



2.2 Sequential Test

When allocating or approving land for development in flood risk areas, those responsible for making development decisions are expected to demonstrate that there are no suitable alternative development sites (of the type and nature proposed by the Core Strategy) located in lower flood risk areas.

PPS25 introduces a Sequential Test that is core to the SFRA process. The Sequential Test is the key driver for the Level 1 SFRA. In order to carry out the Sequential Test the LPA need to know:

- **Spatial extent of flood risk** within the whole LPA area
  - Flood Zones (See **Appendix E**)
    - Flood Zone 1 – Low Probability: less than 1 in 1000 year fluvial flood event
    - Flood Zone 2 – Medium Probability: between a 1 in 100 and 1 in 1000 year fluvial flood event
    - Flood Zone 3a – High Probability: a 1 in 100 year or greater fluvial flood event
    - Flood Zone 3b – Functional Floodplain: land where water has to flow or be stored in times of flood
  - Flooding from other sources
- **Location of proposed development sites** and the proposed vulnerability of that development in flood risk terms (See **Appendix F**)

There are a number of key challenges faced by the LPA in applying the Sequential Test in accordance with PPS25 and its Practice Guide.

The Sequential Test is purely based on the Flood Zones as defined by Table D1 of PPS25, but these zones only take account of fluvial and tidal flooding, which ignore the presence of flood risk management measures such as defences. Other sources of flooding must also be considered in the spatial distribution of development. The PPS25 Practice Guide states that "other forms of flooding should be treated consistently with river flooding in mapping probability and assessing vulnerability to apply the Sequential and Exception Tests" (p.83). However, it can be problematic to map the spatial extent of flooding from other sources as well as matching the level of risk associated with other sources with those presented within the three Flood Zones. For instance, Flood Zone 3 cannot be directly related to a high susceptible area at risk of surface water flooding as the probability and consequences are significantly different.

Whilst it may not be appropriate to avoid development at risk from other sources of flooding, risk should be considered when taking a sequential approach to land use or the substitution of lower development vulnerability in higher risk areas within a development site.

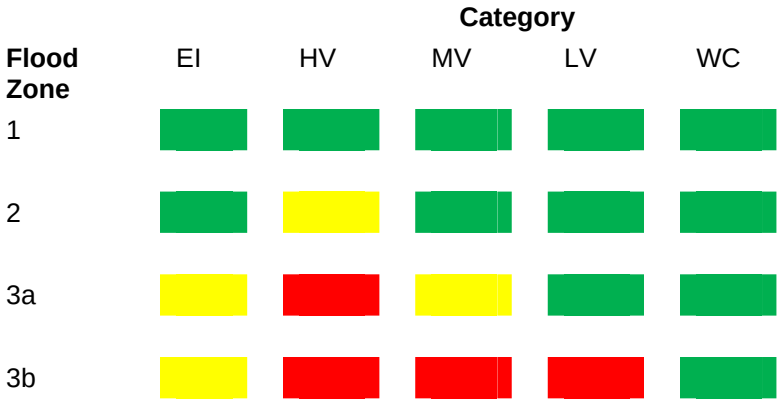
2.3 Exception Test

If the Sequential Test has been successfully applied, following the steps in Figure 2-3, and the LPA cannot allocate development in lower flood risk areas, **Table D.2** of **PPS25** and the vulnerability of development should be referred to. A copy of this Table can be found in **Appendix F.**

Only once the vulnerability of the development is defined using Table D.3 of PPS25 should an assessment be made of whether or not that development is appropriate within that Flood Zone and whether the Exception Test needs to be applied.

Figure 2-2 below has been produced from Table D.3 of PPS25.

Figure 2-2: Where the Exception Test applies



EI = Essential Infrastructure, HV = Highly Vulnerable, MV – More Vulnerable, LV – Less Vulnerable, WC = Water Compatible

Development would be permitted. An FRA would be required in Zones 2 and 3 to demonstrate that the development will be safe and may be required in Zone 1 sites if other sources are present

The Exception Test is required

Development should not be permitted in this zone

Once the requirement of the Exception Test has been identified, three stringent conditions must all be passed in order to pass the Test. If all conditions of the Exception Test cannot be met, planning permission cannot be granted.

These conditions (see **Paragraph D9** of **PPS25**) are as follows:

a) *It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared. If the LDD has reached the 'submission' stage (see Figure 4.1 of PPS12: Local Development Frameworks) the benefits of the development should contribute to the Core Strategy's Sustainability Appraisal,*

b) *The development should be on developable previously-developed land or, if it is not on previously-developed land, that there are no reasonable alternative sites on developable previously-developed land, and*

c) *A site-specific Flood Risk Assessment must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

It will be the requirement of Development Management officers to make sure all parts of the Exception Test have been passed in granting planning permission (see section 3). At a Spatial Planning stage, only the likelihood of passing the Exception Test can be assessed, as actually passing the Test will require the completion of a site-specific FRA to determine if the site and its occupiers will be safe during times of flood.

What should be done at this early stage of the planning process is to identify those sites in which the Exception Test is required and to avoid those sites in which flood risk is too great, using the information provided in the BRO SFRA Volume III, or there is no overriding planning objectives for that development.

2.4 Applying the Sequential Test and Assessing the Likelihood of Passing the Exception Test

This section provides the following guidance on how Spatial Planners are to apply the Sequential and Exception Test within the Sustainability Appraisal of LDDs.

Figure 2-1, discussed earlier on, identifies how flood risk is taken into account in LDDs and introduces the use of the Sustainability Appraisal in applying the Sequential and Exception Tests. What PPS25 does not provide, is step-by-step guidance on how to apply each Test rather the concept in which they are applied.

What the guidance below will do, if followed appropriately, is produce clear and transparent evidence that both the Sequential and Exception Test have been applied, which can then feed into the Sustainability Appraisal process of LDDs. This can either be reported within the Sustainability Appraisal itself or a supporting stand alone document which then feeds into the Sustainability Appraisal.

The guidance provided in this BRO SFRA User Guide should not supersede PPS25 or other plans and policies, but should be seen as a practicable approach in how the LPA should apply the Sequential and Exception Tests within the preparation of the LDF.

2.4.1 Spatial Planning Flow Diagrams and Tables

The following flow diagrams and tables provide a recommended approach for Spatial Planners in applying the two tests, keeping in mind the flood risk management hierarchy of avoid, substitute, control and mitigate, whilst identifying and allocating sustainable development sites.

Colours have again been used to represent key stages in the sequential approach process as identified in Figure 2-1 previously. The same colours are used in the flow diagrams and tables below, the aim of which is to make it easier to identify what guidance relates to individual steps within the sequential approach sequence.

Figure 2-3 below, illustrates the Sequential and Exception Tests as an input, process and output flow diagram. The main inputs being the evidence provided in both the Level 1 and Level 2 SFRA and the LPA Core Strategy and Sustainability Appraisal. The flow diagram begins by the LPA assessing alternative development options at a strategic scale using the Sustainability Appraisal. This then works down using evidence provided in the Level 1 and Level 2 SFRA to avoid inappropriate development sites, substitution within the site boundary and identifying those sites requiring the Exception Test. The flow diagram ends by revisiting and updating the Sustainability Appraisal with the allocation of development sites. Figure 2-3 can be linked to Table 2-1, which provides a more detailed descriptive step by step guidance of the flow process illustrated.

During this process there is a need to identify which sites should be avoided, substituted, those which can go forward, or once the Sequential Test has been applied how to assess if the site will remain safe during the Exception Test. This is a step wise process and must be documented, but a challenging one as a number of the criteria used are qualitative and based on experienced judgement.

Figure 2-4 provides more guidance on using the Sequential Test Spreadsheet produced in the SFRA during Steps 1 to 8. Figure 2-5 provides guidance on how to assess the likelihood of sites passing the Exception Test using key questions and evidence provided in the SFRA in assessing whether a site will remain safe or not during Steps 9 to 10.

Figure 2-3: Sequential and Exception Tests flow diagram

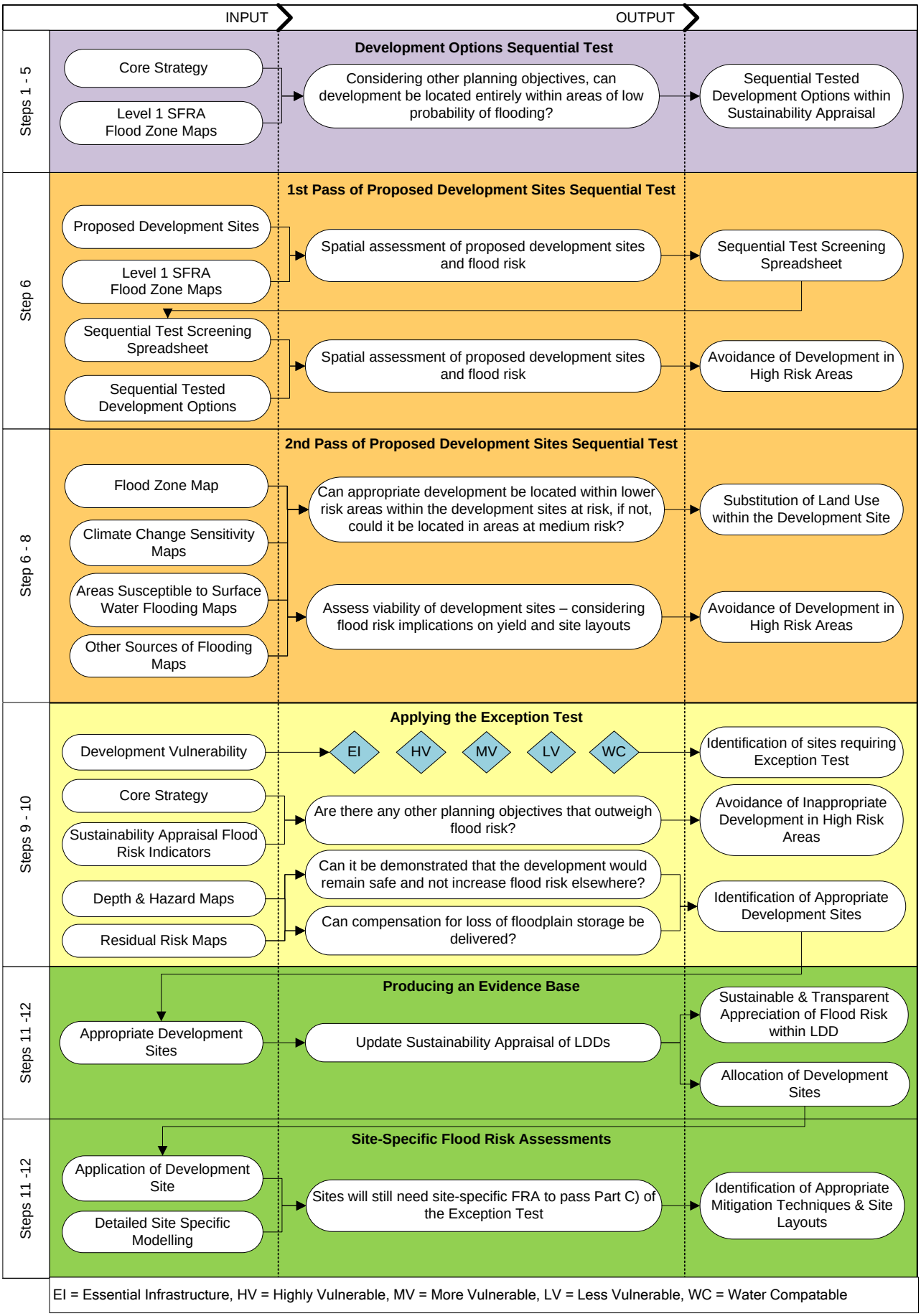


Table 2-1: Sequential and Exception Tests key steps

Applying the Sequential Test during the SA of Development Options

Step 1 - State the **geographical area** over which the Sequential Test is to be applied. This can be over the entire LPA area but will usually be reduced to communities to fit with functional requirements of development or objectives within RSS or Core Strategy

Step 2 - Identify reasonably available areas of strategic growth

Step 3 - Identify the presence of **all sources of risk** using the evidence provided in this SFRA

Step 4 - **Screen available land** for development in ascending order from Flood Risk Zone 1 to 3, including the subdivisions of Flood Risk Zone 3

*This can be achieved using the information provided in the **Sequential Test Spreadsheet** (See Volume II section 4). The screening spreadsheet provides a spatial assessment of each proposed development site provided by the LPA against Flood Zones and Environment Agency surface water susceptibility zones*

Step 5 - Could all development be located in lower risk areas? If not, move onto the next Steps

1st and 2nd Pass of the Proposed Development Sites Sequential Test

Follow Figure 2-4 using the Sequential Test Spreadsheet to:

Step 6 - Identify those sites which should be **avoided** where risk is considered too great and there is no strategic planning objectives identified in Core Strategy

Step 7 - Identify those sites in which the consequence of flooding can be reduced through **substitution** within the site boundary

Step 8 - Assess yield and layout issues for remaining high risk sites to check whether development is viable

Identify the Likelihood of passing the Exception Test

Follow Key Questions imbedded within Figure 2-5 and SFRA evidence to identify the likelihood of those sites remaining at risk passing the Exception Test. The community risk review tables produced in Volume III section 8 can aid this process

Step 9 - Assess the compatibility of the **development vulnerability** using Table D.2 of PPS25 and identify the requirement of passing the **Exception Test** using Table D.3 of PPS25

Step 10 - Use the SA to assess alternative development options by balancing flood risk against other planning constraints. **Proposed sites should be avoided and removed if it is unlikely to pass the Exception Test i.e. if**:

- Key Questions in Figure 2-5 attributes a significant negative response
- Where development will require significant mitigation measures to make the site safe and to reduce impacts downstream
- Where the requirement of loss of floodplain compensation cannot be delivered

Producing an Evidence Base

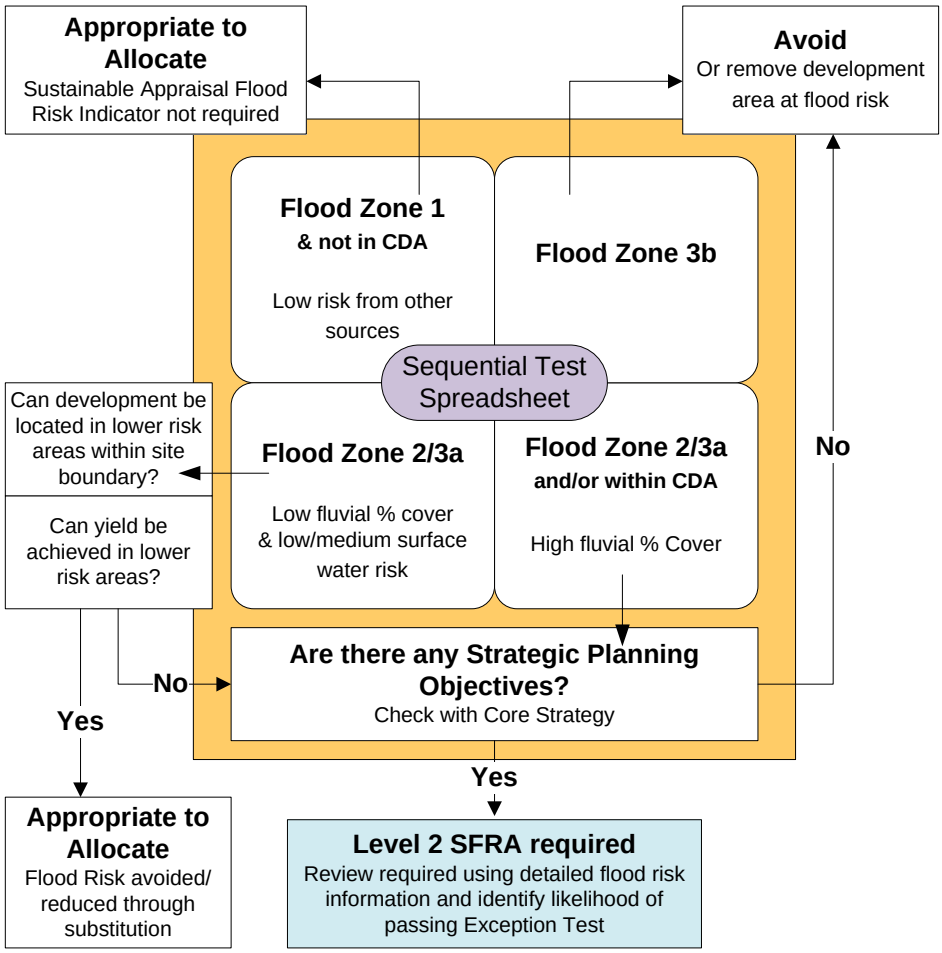
The following steps should be used within the SA to produce the evidence that all tests have been applied:

Step 11 - **Produce a supporting stand alone document** recording all decisions made during Steps 1 to 10. Each proposed development site should be referenced and the decisions made to avoid, substitute, or allocate the site and the evidence used. This can be incorporated within the appendix of the SA

Step 12 - **Allocated development allocations within the SA**, including appropriate flood risk policies and development guidance on each allocated site. Guidance should include the need for appropriate site-specific FRAs.

*The Environment Agency and other relevant stakeholders (such as United Utilities or British Waterways) should be **consulted** on any policies drafted that inform the application of the Exception Test and the production of FRAs within the LPA area*

Figure 2-4: 1st and 2nd pass of proposed development sites Sequential Test



Once the requirement for a Level 2 SFRA has been identified, Spatial Planners will need to assess the likelihood of sites passing the Exception Test. ***This is seen as a critical part of the spatial planning process by avoiding inappropriate development being allocated.*** The Environment Agency and/or Development Management are likely to object to inappropriate development.

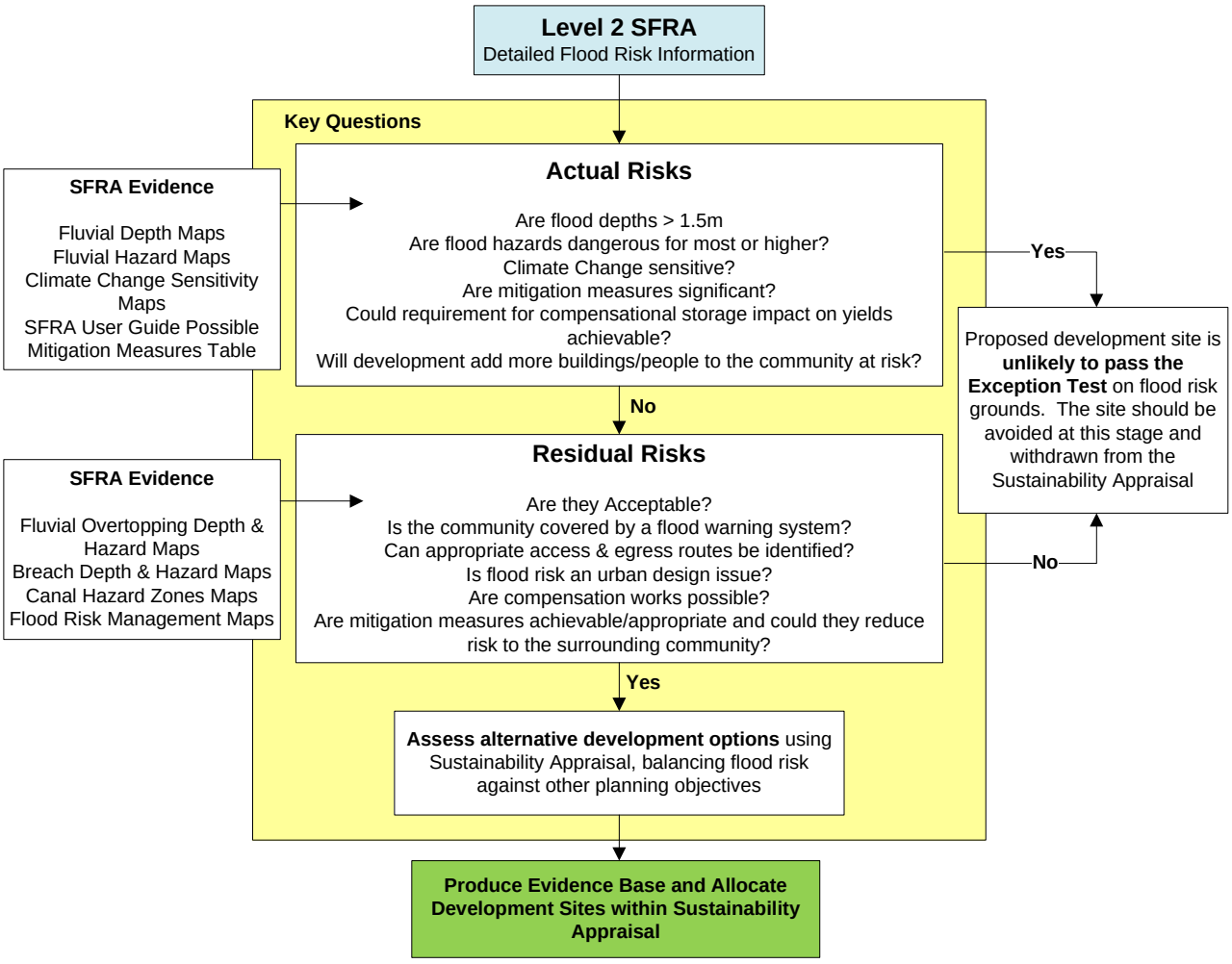
During Steps 9 and 10, Spatial Planners are asked to assess whether or not a site highlighted at flood risk has the potential to pass the Exception Test. This requirement can be linked to Figure 2-5 illustrated below.

By following Figure 2-5, Spatial Planners should be able to obtain a greater understanding on the level of flood risk present at each key development site that remains following the application of the Sequential Test.

A review of the flood risk associated with key communities (Ramsbottom, Bury-Radcliffe, Rochdale, Littleborough and Shaw) has been provided in BRO SFRA Volume III section 8 and should help to support the decision on the likelihood of sites passing the Exception Test in these areas. Individual sites have already been assessed for Ramsbottom and Littleborough against a number of these key questions and can be found in BRO SFRA Volume III Appendix A.

During Steps 9 and 10, following Figure 2-3, Spatial Planners should use the Sustainability Appraisal process to assess alternative sites against flood risk indicators and other planning considerations. **Whilst a balance is require, the Exception Test can be a show stopper in that planning permission cannot be granted if all criteria of the Exception Test cannot be met.** Once this has been completed, Steps 11 and 12 can be carried out, producing the evidence base for the Sustainability Appraisal, allocating appropriate development sites, producing flood risk policies and development guidance.

Figure 2-5: Identifying the likelihood of passing the Exception Test



2.5 Flood Risk and other Land Use Policies

Flood risk is a material consideration in land use planning decision making and can greatly impact on the sustainability of various land uses in all locations. Having applied the Sequential Test and Exception Test where necessary, the resultant assessment of appropriateness and associated flood risk information will then influence the land use planning decision at whatever level it is being considered.

Land use policies and wider strategic decisions involving social and economic development in the LDDs will be influenced and shaped by the sequential approach informed by this SFRA.

For instance, the Green Infrastructure (GI) of Bury, Rochdale and Oldham is part of the council area's life support system. It is a planned and managed network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and rural fringe consisting of:

- Open Spaces – parks, woodlands, nature reserves, lakes
- Linkages – River corridors and canals, pathways and cycle routes and greenways
- Networks of "urban green" – private gardens, street trees, verges and green roofs

With regards to flood risk, green spaces can be used to manage storm flows and free up water storage capacity in existing infrastructure to reduce risk of damage to urban property, particularly in town centres and vulnerable urban regeneration areas. GI can also improve accessibility to

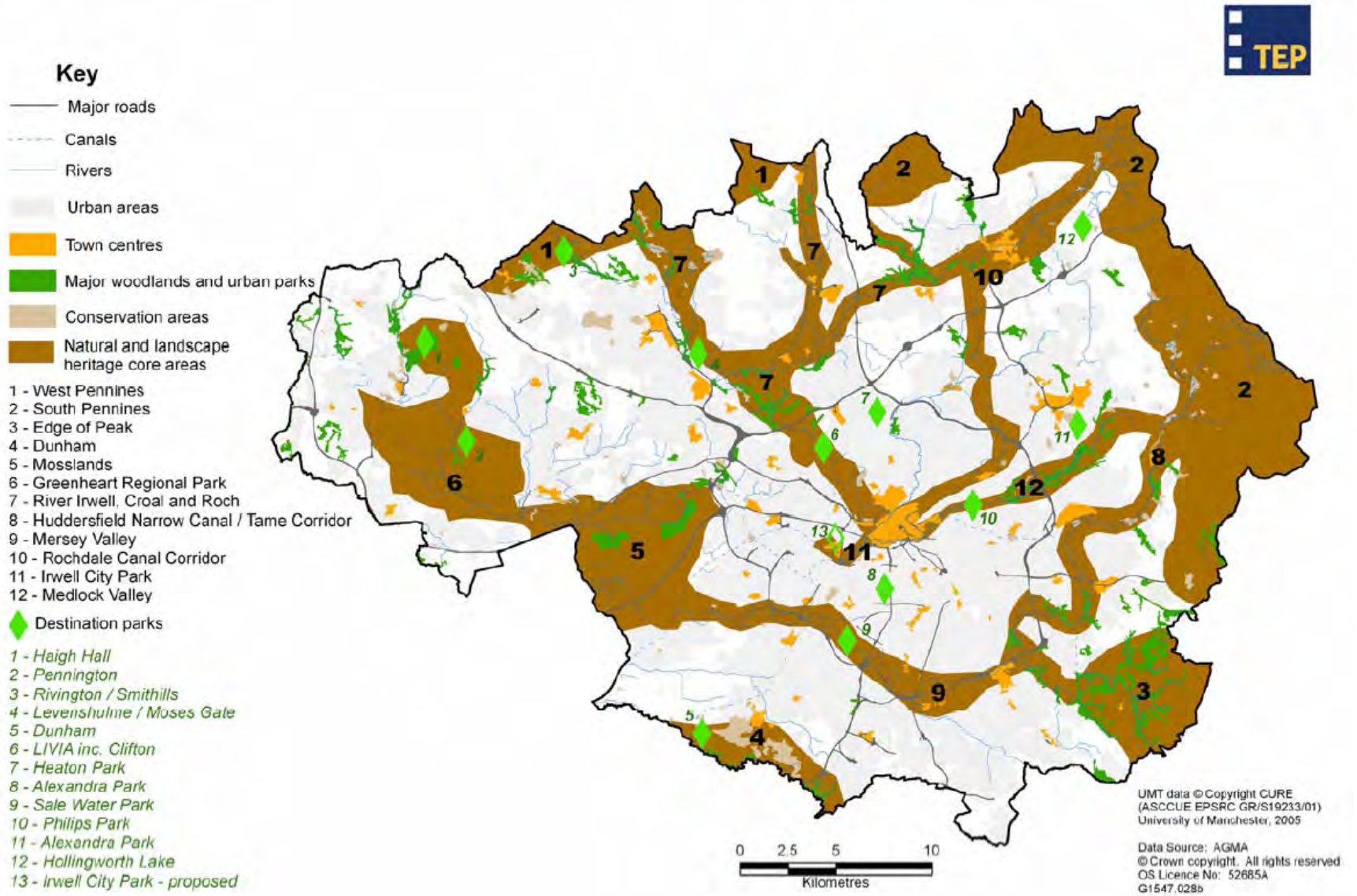
waterways and improve water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity.

The Greater Manchester Green Infrastructure Study was published in September 2008 by TEP for AGMA and Natural England on the feasibility of a GI framework for Greater Manchester. Figure 2-6 is an extract of the Summary Report illustrating the broad GI network in Greater Manchester.

GI should be incorporated into master planning and individual sites, directed by the need to retain exceedance flood paths and natural attenuation of flood flows.

The evidence provided in the BRO Level 1 and Level 2 SFRA should be used to enhance the Greater Manchester Green Infrastructure Study by identifying opportunities for delivering FRM measures through GI. River corridors identified as functional floodplain are an excellent linkage of GI and can provide storage during a flood event. Areas identified within the urban environment or upstream of a critical surface water flood areas should be incorporated into council GI strategies. Opening up land to create flow paths or flood storage areas can help protect current and future developments.

Figure 2-6: Green Infrastructure and District Places – Key diagram



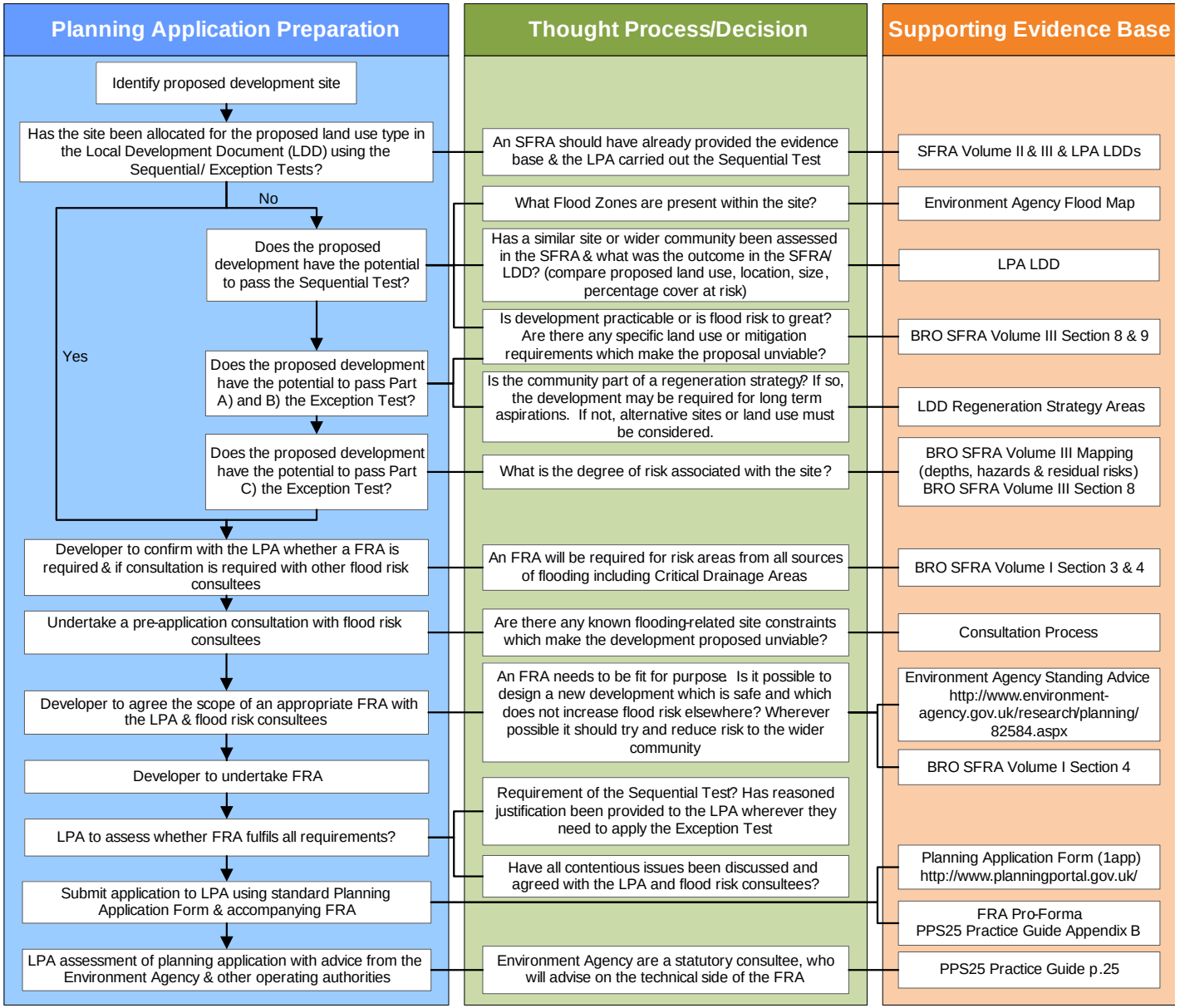
3 GUIDANCE FOR DEVELOPMENT MANAGEMENT

The aim of this section is to provide guidance on the use of the SFRA by Development Management. Planners should also refer to the guidance on SFRA maps provided on page vi and background to the SFRA and flood risk concepts in Appendix A and C.

When it comes to individual planning applications, Planners should use the guidance in this SFRA User Guide, PPS25 and its Practice Guide to:

- ***Check whether the Sequential Test and/or the Exception Test have already been applied***
    - *Refer developer to LDD and supporting evidence to identify if the Sequential Test has been applied and development is likely to pass the Exception Test – site may have already been assessed*
    - *If evidence is available, the Sequential Test and likelihood of passing the Exception Test have been assessed. If no evidence is available, developers must carry out the Sequential and Exception Tests – move on to the next stage*
- ***Refer developer to the following in order for them to apply the Sequential and Exception Tests***
    - *BRO SFRA Volume II to inform Sequential Test*
    - *Sequential Test Spreadsheet to compare similar sites assessed*
    - *BRO SFRA Volume III to inform Exception Test*
    - *BRO SFRA Volume II maps to review scale and nature of flood risk*
    - *BRO SFRA Volume III maps to identify residual risks*
    - *Volume III Chapter 8 to assess likelihood of passing the Exception Test within a reviewed community*
- ***Consult with Environment Agency and other relevant stakeholders to***
    - *Assess flood risk constraints identified on site using the BRO SFRA*
- ***Scope an appropriate FRA***
    - *What is the scale and nature of risk from all sources?*
    - *Does the site lie within a CDA identified in Volume III section 5?*
    - *Are there any strategic mitigation requirements identified in Volume III section 9 and/or LDD?*
    - *Refer developers to section 4, 5 and 6 of this SFRA User Guide*
- ***Consult with Environment Agency over FRA acceptance/approval***

Figure 3-1: Planning applications and flood risk



3.1 Introduction

The LPA are the principal decision-makers on applications for new development. This is carried out through Development Management. Whilst it is the overall responsibility of the developer to carefully consider flood risk issues regarding their proposed development site, the LPA should be involved at the earliest possible stage during pre-application discussions.

Following on from recommendations made in the Pitt Review, Development Management must take some of the roles and responsibilities from the Environment Agency as the first point of call in Flood Risk Management and planning applications.

The consideration of flood risk within the context of an individual site planning application is shown on Figure 3-1. It highlights how to take account of flood risk using the information provided within the BRO Level 1 and Level 2 SFRA and the guidance provided in PPS25 and by the Environment Agency Standing Advice.

Development Management officers should refer to page vi of this report for map numbers.

If an individual site has been identified for development, Development Management must check that the development is sound regarding flood risk i.e. it has passed the Sequential Test and is likely to pass the Exception Test where applicable and that it is supported by a coherent FRA which meets the requirements of PPS25.

Development Management officers must always consider development from a strategic view point and the cumulative effect of all proposed development taking place, even though applications for developments are submitted at a site level. It should not be presumed that flood risk has been understood at a strategic high level and that one application may need to fit within a flood risk management strategy for an area.

3.2 The Sequential Test and Exception Test

If the proposed site is already identified in a Sequentially Tested LDD, which is supported by the findings of the BRO SFRA and transparent evidence that the Sequential Test has been carried out, the site will already have been through the Sequential Test. The developer must still apply the sequential approach to site layout when matching land use vulnerability within flood risk areas as described in PPS25 and pass the Exception Test.

However, where a site has not been identified within a Sequentially Tested LDD, the Sequential Test will need to be applied i.e. the developer will need to provide evidence to the LPA that there are no other reasonable available sites where the development could be located. The LPA will then use this information to apply the Sequential Test. This particularly applies to Windfall Sites that have not been allocated in the LDF.

Development Management and developers should refer to section 2.4 of this report for guidance on applying the Sequential and Exception Tests. This includes identifying a zone of search to apply the Sequential Test as recommended. If the zone of search is reduced from the full council area to an individual community or specific location, it is critical that evidence is provided to justify this decision. For example the area may have an essential requirement for this type of development or provides essential services for the development.

Developers will need to provide evidence that the Exception Test can be passed. This will be needed for allocated and windfall sites, if required according to the vulnerability of the proposed land use, areas requiring redevelopment or regeneration, redevelopment of existing single properties or changes of use. Development Management will then need to review the evidence provided and decide whether a site passes the Exception Test.

The community flood risk review tables provided in the BRO SFRA Volume III section 8 should help Development Management identify where windfall development may be appropriate on flood risk grounds. Development in certain communities may find it difficult to pass both the Sequential Test and Exception Test due to the nature of flood risk and/or the scale of mitigation which would be required in order to make the development safe.

Some communities may require a strategic approach when it comes to planning development, due to the possibility of large off site impacts caused by piecemeal development. In this case individual developments must adhere to the wider strategic approach towards flood risk management outlined in the BRO SFRA Volume III section 9. These should be transformed into flood risk policies within the appropriate LPA LDDs. More detail on mitigation options is also provided in section 5 of this Volume.

PPS25 Practice Guide section 4.23 to 4.45 provides more detail and recommended approach on how to apply the Sequential Test and Exception Test to individual planning applications, windfall sites, existing and single properties and change of use and must be referred to.

3.3 Supporting the FRA Process

All development applications must be supported by an appropriate site-specific FRA in accordance with the guidance provided in **PPS25 Practice Guide section 3.80 to 3.90**. Further guidance is also provided in section 4, 5 and 6 of this Volume.

At the first possible stage Development Management should refer the developer to the BRO SFRA (all Volumes) and the flood risk mapping provided within. The developer should also be referred to the appropriate LDD and flood risk policies which could potentially influence their proposed development.

If the site or community has been identified at risk of flooding from any source, Development Management and the developer should consult the Environment Agency and other relevant flood risk consultees, such as United Utilities or British Waterways, to identify known flood-related site constraints and agree the scope of an appropriate FRA.

The Environment Agency Standing Advice should be used at this stage. This can be accessed online at http://www.environment-agency.gov.uk/research/planning/82584.aspx

The Environment Agency is a statutory consultee for specific categories of development where flood risk is an issue. Table 3-1 outlines a number of considerations which should trigger the involvement of the Environment Agency within the FRA process. These also highlight the requirement of a more detailed FRA.

Table 3-1: FRA considerations and SFRA supporting evidence

Considerations	Supporting evidence in the SFRA
The development other than minor development is situated in Flood Zone 2 and 3	Volume II Flood Zone Maps or Flood Zones on Environment Agency website if updated. *See PPS25 Practice Guide section 2.46 for definition of major developments*
The development is greater than 0.5ha and situated in Flood Zone 1, but there are critical drainage problems (i.e. the development lies within a Critical Drainage Area)	Volume II Critical Drainage Area Maps
The development is at risk of flooding from other sources of flooding	Volume II Surface Water Maps Volume III Canal Hazard and Refined Surface Water Maps
The development is situated behind flood defences (possibility of overtopping during extreme flood event or breach)	Volume III SFRA Asset Database (section 2) and Flood Risk Management Maps Volume III Depth and Hazard Maps for both the 1 in 100 and 1 in 1000 year flood events Volume III Fluvial Breach Maps
The development exceeds 1ha in size	Consult Environment Agency
The development is within 20m of the bank top of a Main River – the Environment Agency will have to consent to any work within 5m of a Main River and are likely to object in principal to any development within these areas	Consult Environment Agency
Any culverting operation or development which controls the flow of any river or stream	Consult Environment Agency

Please see page vi for map references

4 GUIDANCE FOR DEVELOPERS

The aim of this section is to provide guidance on the use of the SFRA by Developers. Developers should also refer to section 4, guidance on SFRA maps provided on page vi and background to the SFRA and flood risk concepts in Appendix A and C.

Developers should use the guidance in this SFRA User Guide, PPS25 and its Practice Guide to:

- ***Assess whether the site is a***
    - *Windfall development, allocated development within the LDF, within a regeneration area, single property or change of use to identify if Sequential and Exception Tests are required*
- ***Check whether the Sequential Test and/or the Exception Test have already been applied***
    - *Request information from the LPA on whether the Sequential Test or likelihood of the site passing the Exception Test have been assessed*
    - *If not, provide evidence to the LPA that the site passes the Sequential Test and will pass the Exception Test*
- ***Consult with LPA Development Management, the Environment Agency and the wider group of flood risk consultees where appropriate to scope an appropriate FRA if required.***
    - *Guidance on FRAs provided in this SFRA User Guide*
    - *Are there any strategic mitigation requirements identified in the BRO SFRA Volume III section 9 and/or LDD?*
    - *Also refer to Environment Agency Standing Advice, CIRIA Report C624, PPS25 and its Practice Guide*
    - *Consult LPA emergency planners if required*
- ***Submit FRA to Development Management and Environment Agency for approval, where necessary***

4.1 Introduction

Flood risk should first be considered from a strategic view point even though applications for proposed developments are submitted at a site level. The SFRA provides the evidence base for developers to assess the flood risk to a site at a strategic level and scope an appropriate site-specific Flood Risk Assessment. Developers should liaise closely with the LPA during the pre-application stage of development to determine if a site is suitable, and if so what type of development is appropriate, given the application of the Sequential Test and likelihood of passing the Exception Test as required by PPS25. If a site is suitable then developers should prepare a site-specific Flood Risk Assessment, in close liaison with the LPA and Environment Agency.

Developers should consider all sources of flood risk when assessing whether a site is suitable for development. Guidance on developing in Critical Drainage Areas and areas at risk from sources other than fluvial is provided in this section.

Figure 3-1 in the Guidance for Development Management (section 3) provides a useful overview of the consideration of flood risk within the context of an individual site planning application.

4.2 The Sequential Test and Exception Test

The Sequential Test and Exception Test are fundamental to PPS25 in determining the suitability of land for development in regard to flood risk and avoidance of flood risk to new development. These tests may still be required at an individual site level. Table 4-1 identifies when the Sequential and Exception Tests are required for certain types of development and who is responsible for providing the evidence and those who need to apply the tests. Further information is provided in section 4 of the PPS25 Practice Guide.

If the Developer is required to provide evidence that the site can pass the Sequential Test and/or Exception Test if appropriate, then further guidance on these can be found in section 2 of this User Guide.

Table 4-1: Development types and application of Sequential and Exception Tests

Development/ PPS25 PG Reference	Sequential Test		Exception Test	
	Required?	Who Applies the Test?	Required?	Who Applies the Test?
Allocated Sites *Sect. 4.23–4.31*	No	LPA should have already carried out the test during the allocation of development sites within their LDD	Dependent on land use vulnerability (Appendix F)	LPA to advise on the likelihood of passing test. But the developer must provide evidence that the Test can be passed by providing planning justification and producing a detailed FRA
Windfall Sites *Sect. 4.33–4.35*	Yes	Developer provides evidence that the test can be passed to the LPA. An area of search to be agreed, but should be within local community boundary.	Dependent on land use vulnerability (Appendix F)	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Regeneration Sites Identified Within LDD *Sect. 4.36–4.38*	No	-	Dependent on land use vulnerability (Appendix F)	LPA to advise on the likelihood of passing test. But the developer must provide evidence that the Test can be passed by providing planning justification and producing a detailed FRA
Renewable Energy Projects Sect. 4.39	No	PPS22 Renewable Energy advises the LPA not to use a sequential approach in the consideration of such proposals	Dependent on land use vulnerability.	LPA to advise on the likelihood of passing test. But the developer must provide evidence that the Test can be passed by providing planning justification and producing a detailed FRA. Part B of the Exception Test may not apply in accordance with PPS22.

Development/ PPS25 PG Reference	Sequential Test		Exception Test	
	Required?	Who Applies the Test?	Required?	Who Applies the Test?
Redevelopment of Existing Single Properties *Sect. 4.40-4.41*	No	-	Dependent on land use vulnerability (Appendix F)	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Changes of Use *Sect. 4.42-4.45*	No	-	Dependent on land use vulnerability (Appendix F)	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA

4.3 Site Specific Flood Risk Assessments

Site specific Flood Risk Assessments (FRAs) are prepared by those proposing development. The principal aims of a FRA are to determine the acceptable management of flood risk to the development proposal itself and any impacts elsewhere, and to ensure that the development and its users/occupants remain safe in times of flood.

Once the site has been through the Sequential Test and has been identified as being likely to pass the Exception Test a site-specific FRA should be undertaken. The LPA and Environment Agency should be consulted in order to scope the content and level of the FRA.

There are three levels of FRA:

- **Level 1-** *Screening study, to identify whether there are any flooding or surface water management issues that need to be considered further*
- **Level 2-** *Scoping study, to be undertaken if the Level 1 FRA indicates that there are flood risk issues needing further consideration and these risk can be readily quantified*
- **Level 3-** *Detailed study, where further quantitative analysis is required to appropriately assess flood related issues and determine any effective mitigation measures needed to be put in place*

It should be recognised that the SFRA has assessed flood risk at a strategic level, which can be used to provide evidence for a Level 1 and Level 2 FRA. However, where a more detailed FRA is required the developer should undertake a detailed assessment of the flood risk to the site, using the SFRA to scope out flood risk issues and referring to the guidance in the SFRA User Guide, PPS25, its Practice Guide and CIRIA Report Development and Flood Risk. Developers should satisfy themselves that the data provided in this SFRA is up-to-date and accurate for their development.

Table 4-2 scopes when a more detailed FRA is likely to be required. The actual scope of the FRA should be agreed between the developer, LPA and Environment Agency before it is undertaken.

Table 4-2: FRA considerations and SFRA supporting evidence

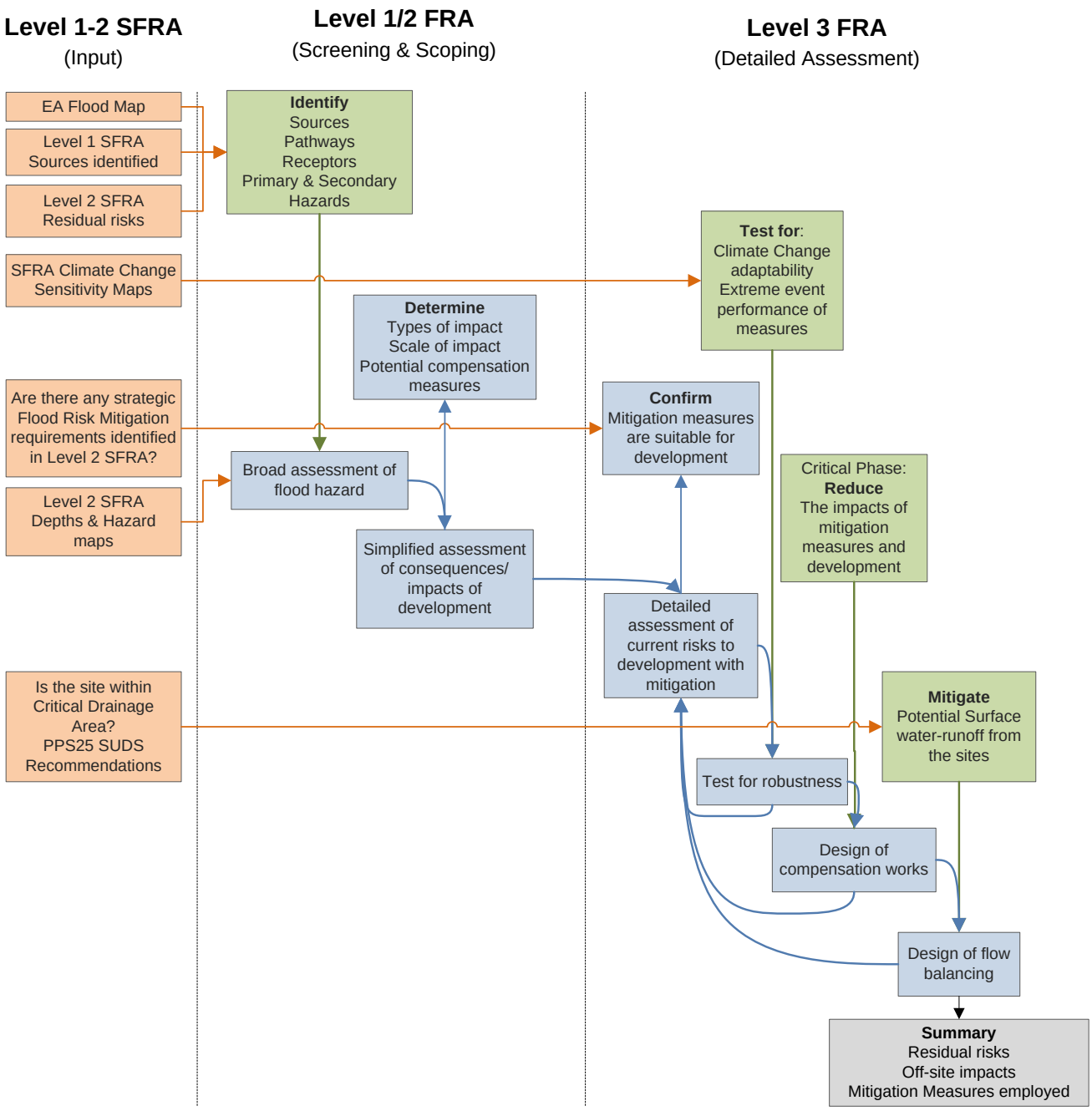
Considerations	Supporting evidence in the SFRA
The development other than minor development is situated in Flood Zone 2 and 3	Volume II Flood Zone Maps or Flood Zones on Environment Agency website if updated. *See PPS25 Practice Guide section 2.46 for definition of major developments*
The development is greater than 0.5ha and situated in Flood Zone 1, but there are critical drainage problems (i.e. the development lies within a Critical Drainage Area)	Volume II Critical Drainage Area Maps
The development is at risk of flooding from other sources of flooding	Volume II Surface Water Maps Volume III Canal Hazard and Refined Surface Water Maps
The development is situated behind flood defences (possibility of overtopping during extreme flood event or breach)	Volume III SFRA Asset Database (section 2) and Flood Risk Management Maps Volume III Depth and Hazard Maps for both the 1 in 100 and 1 in 1000 year flood events Volume III Fluvial Breach Maps
The development exceeds 1ha in size	Consult Environment Agency
The development is within 20m of the bank top of a Main River – the Environment Agency will have to consent to any work within 5m of a Main River and are likely to object in principal to any development within these areas	Consult Environment Agency
Any culverting operation or development which controls the flow of any river or stream	Consult Environment Agency

Please see page vi for map references

The detail required for each level of FRA is highlighted in Figure 4-1 below. The production of a site-specific FRA can be seen as an iterative process with those carrying out a Level 1 FRA before moving on to a Level 2 and finally a Level 3. It is appropriate to review the level of risk present to assess whether development is appropriate and achievable before moving onto the next stage.

A larger number of iterations and/or consultations on the FRA maybe needed if significant mitigation measures are proposed and compensational storage is required to assure the LPA and Environment Agency that the development can remain safe and meets all requirements. This figure also links the evidence provided in the BRO SFRA which can aid the decision making process. Section 5 and Appendix G of this Volume and Volume III section 9 should also be referred to regarding appropriate mitigation measures.

Figure 4-1: FRA preparation



Please see page vi for map references

4.4 FRA Guidance

Flood Risk Assessments should follow the approach recommended by:

1. The Environment Agency Standing Advice – this can be found at the website below (http://www.environment-agency.gov.uk/research/planning/82584.aspx)
2. CIRIA Report C624 Development and Flood Risk – Guidance for the Construction Industry
3. PPS25 and its Practice Guide

These documents describe when a FRA is required and what it should contain. They guide developers to produce a "fit for purpose" FRA.

The key requirements of a FRA are provided in section 3 of the PPS25 Practice Guide. The FRA should answer the following questions:

1. Development Description and Locations

- What is the type of development and where will it be located?
- What is the vulnerability classification of the current and future use of the development site (using **Table D.2 of PPS25**)?
- Has the development site been assessed during the Level 1 and Level 2 SFRA and is in line with LDDs? If so the Sequential and Exception Test may have already been applied - See guidance in **section 4.2**

2. Definition of Flood Hazard

- What sources of flooding could affect the site? – See Volume II and III Mapping
- For each source, how would flooding occur, referencing any historical records where these are available?
- What existing surface water drainage requirements are present on the site? – See **section 4.6** on CDAs and consult with LPA, Environment Agency and Untied Utilities

3. Probability

- Which Flood Zones are present within the site? – See Flood Zone Map
- What actual and residual risks are associated with the site? – See FRM, depth and hazards and canal hazard maps
- What are the existing rates and run-off volume generated by the site?

4. Climate Change

- How is flood risk at the site likely to be affected by climate change? – See climate change maps

5. Flood Risk Management Measures

- How will the site be protected from flooding, including the potential impacts of climate change, over the development's lifetime? Developers should refer to section 5 of this Volume for details on appropriate mitigation. They should also refer to section 8 and 9 of Volume III regarding the community flood risk reviews and mitigation strategies.

6. Off Site Impacts

- How will the proposed development and measures be implemented to protect the site from flooding and prevent run-off be designed to not increase flood risk elsewhere and where achievable reduce flood risk to the surrounding community?
- This should also include compensation storage where required

7. Residual Risks

- What flood-related risks will remain after mitigation measures have been implemented to protect the site from flooding?
- How, and by whom, will these risks be managed over the lifetime of the development?
- Developers should refer to section 6 of this Volume for guidance on developing an emergency Flood Plan for a development site.

4.5 Considering Other Sources of Flooding

Flood Risk Assessments must take account of flood risk from all sources, rather than concentrating on fluvial, tidal or surface water flood risk. The BRO SFRA Volume II has gone some way in identified the presence of these sources, whilst the BRO SFRA Volume III has provided a more detailed analysis of the actual and residual risk associated with them where practicable.

4.5.1 Canals

Developers should be aware that any site that is at or below the top of a canal bank level may potentially be subject to canal flooding. The possible flood mechanisms include:

- Canal bank overtopping
- Canal embankment breach

Severe cases of canal bank overtopping may lead to breach failure depending on the geometry and characteristics of the canal at that location. Flood volumes and flood risk caused by canal bank overtopping are usually much lower than those arising from a breach of a canal embankment. This is since canals are usually maintained so that they have additional capacity to deal with storm runoff. When overtopping occurs this will be limited to the additional volume of water entering the canal that causes the canal water level to rise above the normal maintained water level, plus this factor of safety. If the canal was to breach then a greater volume of water could leave the canal over a much shorter amount of time.

The SFRA has identified that the residual risk associated with overtopping and breaching from canals is a particularly important issue within the three local authority boundaries. Whilst a low probability occurrence, the consequences are such that this source should be considered within a flood risk assessment that accompanies a development application. The BRO SFRA Volume III has identified indicative canal hazard zones that will aid in scoping where a FRA will be required and what level of detail is appropriate. Flood risk from canals may not affect the same areas identified in the flood zone maps or it may add another source of flooding that must be considered.

It should be noted that the Rochdale Canal is a designated Special Area of Conservation. This may affect the way in which any proposed mitigation is delivered or managed (including a potential requirement for Appropriate Assessment, which would involve consultation with Natural England).

Indicative Canal Flood Hazard Zones

As part of the Level 2 SFRA, a direct canal flood hazard zone has been produced to identify those areas potentially at risk from the Rochdale and Manchester, Bury and Bolton Canals. This zone is indicative and is based on areas geographically adjacent to the canal system and/or below the impounded lengths of critical embankments. These zones are there to trigger the scoping stage of a flood risk assessment, and should not be considered as comprehensive. It is the developer's responsibility to ensure that where a site is below canal level and within 1km that the screening exercise is undertaken and reported on in the FRA.

Within the SFRA direct hazard zone a FRA must appraise the actual risk of flooding to the site due to overtopping and/or breaching of the canal. Guidance on this is provided below.

As part of the Level 2 SFRA, an indirect canal hazard zone has been produced to show the impact that a breach in the canal embankments upstream of Rochdale town centre could have on water levels in the River Roch if it occurred coincidental with a 1 in 100 year flood event on the river. It is considered likely that during such an extreme event that critical infrastructure such as canals, bridges and weirs fail or are compromised and pose an enhanced flood risk.

Guidance for Developing in the Direct Canal Hazard Zone

If a proposed development site is located within the SFRA direct canal hazard zone then a three stage approach is proposed which may include some or all of site screening, scoping and a detailed assessment.

Stage 1: Site Screening

The FRA should address the following questions for overtopping and breach as a first stage:

- Is the site within the SFRA direct canal hazard zone?
- Is the proposed finished level of any part of the site lower than the canal bank level and within 1km of the canal?
- Is the canal embanked above the site?

- Have there been past incidences of canal breach which may show that the location of the development site is vulnerable to canal breach?

If the response to any of these questions is yes, canal overtopping and breach flood risk should be considered in a Scoping Stage.

Stage 2: Scoping

Overtopping

If the screening identifies a second stage for canal overtopping risk is required the following questions should be addressed:

- **If high water levels occur in the canal close to the site, based on an assessment of both bank levels, is it possible that canal spill is likely to be towards, as opposed to away from, the site?** If the opposite bank to that of the proposed site is lower it is likely that any spill will occur from this canal bank and not from the canal bank adjacent to the site.
- **Have there been past incidences of canal overtopping which may show that the location of the development site is vulnerable to canal overtopping?** The canal pound is the body of water contained between the lock gates. The canal pound length is the distance between the lock gates for the body of water. The canal pound length adjacent to the site may receive water from an upper pound and may discharge water to a lower pound in storm conditions. The size of the bywashes control the water level rise and in some cases may not have capacity to deal with an extreme event. There may be additional lateral spillways for the control of water level rise within the pound length. Lower canal freeboard may increase the likelihood of canal overtopping in that location. Acts of vandalism may have caused overtopping in the past. Advice on any locations of historic overtopping is available from British Waterways.
- **Is the nature of the topography surrounding the canal pound length such that the canal is likely to intercept significant slope rainfall-runoff in the 1 in 100 year storm conditions with climate change?** A canal in cutting may intercept rainfall-runoff from both banks causing water level rise in the pound length. A significant volume of rainfall-runoff in the 1 in 100 year event with climate change could cause overtopping within the pound length if the bywashes and spill structures are of insufficient capacity to control water level rise for that event and if there are raised embankments within the same pound length. The catchment for the canal pound is the area receiving runoff in a storm event which will include the canal water area, the towpath and may include areas beyond the canal on one or both banks as stated above. A canal pound with adequate bywashes and spill structure capacities that does not have a receiving catchment significantly larger than the width of the canal and its towpath is unlikely to have an overtopping problem unless historic events suggest otherwise.

If the response to any of these questions is yes, canal overtopping flood risk should be carried forward into Stage 3 and would also prompt a review of breach potential.

Breaching

If screening suggests a second stage for canal breach risk is required the following questions should be addressed to scope the appropriate form of a canal breach and hence the flood risk to the development site. This may require expert advice from an engineering consultant:

- **Could overtopping cause a breach of the canal?** Canal bank overtopping could lead to canal embankment failure depending on the nature of the bank material, the surface covering, overtopping flows and bank geometry. Small overtopping flows would be unlikely to lead to breach formation. The erosion potential of canal embankments should be quantified.
- **Is a breach possible from the bank geometry?** A breach is only likely to occur if the canal top of bank levels are sufficiently high above surrounding ground levels to form a raised embankment with a slope sufficiently steep to be susceptible to breach failure. British Waterways record particularly high embankments as principal embankments and they hold a record of the locations. Preliminary cross sections of the embankment and its constituent materials should be assessed to determine an appropriate breach mechanism.
- **Have there been past incidences of canal breach which may show that the location of the development site is vulnerable to canal breach?** Past breach failures may have been caused by overtopping of the canal bank or failure of the canal lining. Advice on

locations of historic breaches is generally available from British Waterways.

- **Are any structures such as aqueducts in poor condition?** Aqueducts in poor condition will have a higher propensity to fail, and may have to be considered specifically.
- **Are there any local culverts underneath the canal that may have insufficient capacity?** The most serious breach in the past on the Rochdale Canal has been caused by culvert blockage and floodwater damming behind the canal which led to a breach of the canal.

If the response to any of these questions is yes, canal breach flood risk should be carried forward into Stage 3. If a canal breach is considered unlikely but the site is immediately below a canal then the FRA should consider what, if any, residual risk could be associated with the canal. Mitigation measures could include incorporating flood resilience measures into low level properties and raising ground levels.

Stage 3: Detailed Assessment

The scoping exercise may identify that a detailed assessment is required. It is expected that Stage 3 will only be required within the direct zone, where scoping identifies raised embankments where their breach would cause potential for loss of life and property damage.

Overtopping

If a third stage for canal overtopping risk is required the following should be addressed:

- **Construct a hydraulic model.** A hydraulic model should be constructed in order to understand the inflows and outflows to the canal during a 1 in 100 year flood event, considering climate change. Inflows should consider runoff from towpaths and embankments and/or slopes (if applicable), culverts, and upstream inflows through bywashes (around locks) and lock gates.
- **Identify overland flow paths.** If significant overtopping is identified by the inflow/outflow model, then a model should be constructed in order to understand overland flow paths from the canal in the event of overtopping (at the location(s) from which the site could be affected) and the potential depth and hazard associated with canal flooding to the development site. Any uncertainties and assumptions related to this model should be clearly stated. The national Areas Susceptible to Surface Water Flooding map provided in the SFRA and discussions with the Environment Agency will help to identify critical overland flow paths for further detailed modelling.
- **Assess the freeboard required.** Proposed finished floor levels should be assessed in relation to the risk of canal flooding. Risks associated with canal overtopping could be taken into account by raising floor levels (increasing the designed freeboard levels to take account of the risk) as the depths and flows will be generally low. Typically this approach is taken in the design of road and finished floor levels, where a 300mm freeboard is provided to ensure that the primary route for exceedence flows from either the surface water system or the canal is along the road network and away from property. It is the developer's responsibility to assess whether this freeboard is adequate, and the master plan for the site reflects the need to retain and guide overtopping flows to a safe area. Within areas of fluvial or surface water flood risk FRAs will need to consider this along with the measures taken to manage these other sources. Typically a freeboard value is added to the 1% plus climate change flood level to take into account uncertainty and operational issues. Traditionally a value of 600mm is taken. Where a FRA is being undertaken in both the direct and indirect canal hazard zone then the freeboard should be assessed from first principles taking into account flood risk from the canal as another source of uncertainty. A higher freeboard allowance may be required as a result.
- **Assess any residual risks and decide how they should be managed**. Flood warning and resilience measures may be appropriate. The developer should liaise with the LPA and British Waterways to determine suitable emergency planning arrangements.

Breaching

If a third stage for canal breach risk is required the following should be addressed:

- **Assess materials used for the construction of the embankment.** British Waterways advise that some sections of the Rochdale Canal are likely to be constructed of Castleton Sand. Granular materials are likely to be more susceptible to failure than cohesive materials, and will have a different breach mechanism.

- **The structural/geotechnical condition of the canal embankment.** Raised embankments in poor condition, now or in the future, for example with animal burrows, are more likely to fail in breach. Are these principal embankments? This will affect the final breach mechanism adopted.
- **The condition and capacity of any culverts underneath the canal.**
- **The condition of any structures such as aqueducts.**
- **An assessment of the likely mechanisms of canal breach and consequence at the location(s) from which the site could be affected.** A hydraulic model should be constructed in order to understand peak flow, volumes and overland flow paths in the event of a breach and the potential depth and hazard to the development site associated with canal flooding. The canal should be assumed to be at maximum capacity at the time of breach. Any uncertainties and assumptions related to this model should be clearly stated. Additional guidance on the consideration of canal breach mechanisms should be referred to where necessary[4] [5],[6]. A description of typical breach mechanisms is provided below.
- **Proposed finished floor levels in relation to the risk of canal flooding.** Risks associated with canal breach should be taken into account by raising habitable floor levels (increasing the designed freeboard levels to take account of the risk), but FRAs will need to consider this along with the measures taken to manage other sources of flood risk. See note on developing in the indirect canal hazard zone
- **Residual risks and how they should be managed.** Flood warning and resilience measures may be appropriate. It is acknowledged that depending on the likelihood of canal failure and its consequence that the management of this risk should be balanced between resistance and resilience measures (see PPS25 Practice Guide). The developer should liaise with the LPA and British Waterways to determine suitable emergency planning arrangements. It is for the FRA to conclude on that balance and demonstrate that the risk can be managed through design and appropriate awareness raising and flood warnings.

[4] British Waterways (2008) British Standards: Hydraulic Design of Canal Works Good Practice Guide

[5] Dun, R. W. (2006) Reducing uncertainty in the hydraulic analysis of canals, Proceedings of the Institution of Civil Engineers, Water Management 159, pages 211-224

[6] Dun, R. W. (2007) An improved understanding of canal hydraulics and flood risk from breach failures. Water and Environment Journal 21 9-18.

Typical Breach Mechanisms

British Waterways have experience of assessing canal breach mechanisms[1,2,3]. Canal breaches typically occur in a 3 stage mechanism and this is the recommended approach for a detailed breach assessment at Stage 3.

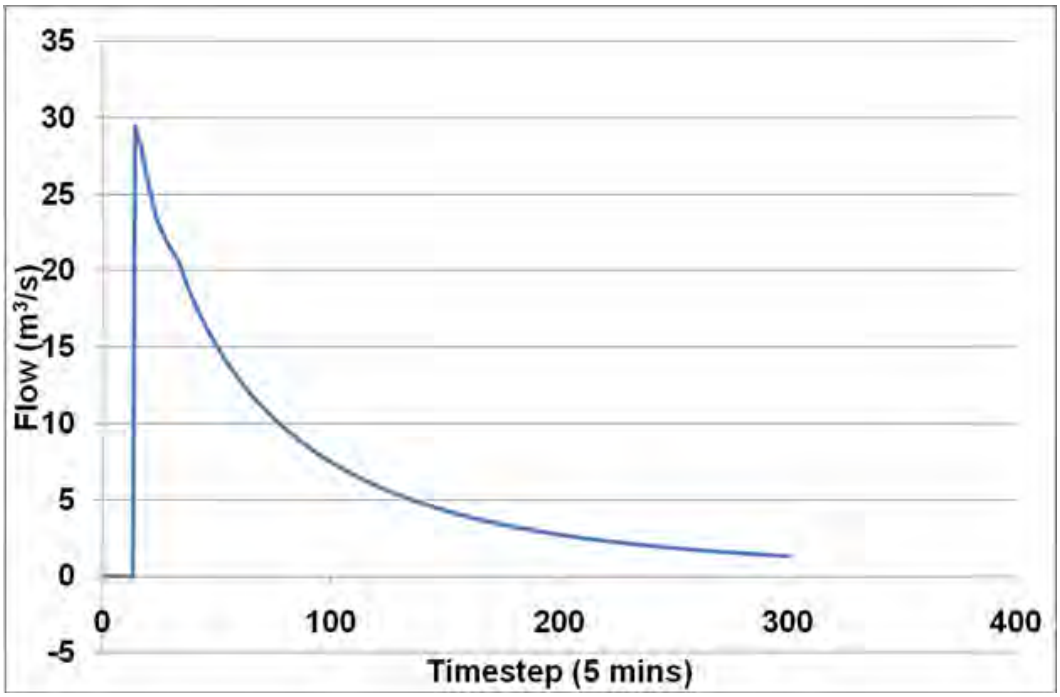
Stage A – In a few breach cases overtopping may lead to progressive erosion of the canal embankment face. In most breach cases failure of the canal lining leads to piping (sub-surface flow) through the canal embankment which gradually erodes the embankment material from within.

Stage B – Overtopping erosion of the canal may lead to a failure of the embankment and a breach of the raised canal bank. The size of the breach in Stage B is typically governed by the depth of the canal. The depth of the breach is down to canal bed level and the width is typically twice the depth so that the breach is approximately semi-circular in shape. For example, on a 1.5 m deep canal, the breach width may be typically 3 m. The time taken to form this breach is dependent on the embankment material. Granular materials will erode faster than cohesive materials. The breach dimensions govern the maximum flow from the canal. Initial tests for the SFRA suggested that an indicative maximum flow is approximately 30m^3/s.

Stage C – When the breach in Stage B has formed to canal bed level, erosion of a soft canal bed will continue to take place along the length of the canal in two directions away from the breach location. As continual erosion of the bed takes place flow from the canal weirs over into the resulting eroded hole. The maximum flow weiring into the eroded hole from each leg of the canal is limited by the width of the canal. This has been modelled by British Waterways as two broad crested weirs.

In those circumstances when no data is available a simplistic but conservative approach can be adopted. The key parameters to replicate are an appropriate peak flow and correct total outflow volume. An example breach hydrograph used in the SFRA is as follows. It is the responsibility of the developer within the FRA to establish whether this sample hydrograph is appropriate to the site.

Figure 4-2: Example breach hydrograph



Guidance for Developing in the Indirect Canal Hazard Zone

If a proposed site is within the indirect canal hazard zone the risk of canal breach in conjunction with high river levels must be considered. The residual risk associated with such an occurrence should be included within the 'freeboard' of finished floor levels where possible. It is the developer's responsibility to assess whether this freeboard is adequate, and the master plan for the site reflects the need to retain and guide overtopping flows to a safe area. Within areas of fluvial or surface water flood risk FRAs will need to consider this along with the measures taken to manage these other sources. Typically a freeboard value is added to the 1% plus climate change flood level to take into account uncertainty and operational issues. Traditionally a value of 600mm is taken. Where a FRA is being undertaken in both the direct and indirect canal hazard zone then the freeboard should be assessed from first principles taking into account flood risk from the canal as another source of uncertainty. A higher freeboard allowance may be required as a result. The SFRA has identified that in Rochdale for example the increase in flood level as a result of a coincident breach and flood event is approximately 300 to 400mm. It is anticipated that this could be included within a traditional freeboard value, although the FRA would need to prove that uncertainty associated with the fluvial sources are not more significant that normal. A higher freeboard allowance in the indirect canal hazard zone of 300mm should be adopted if no further analysis is undertaken.

4.5.2 Reservoirs

As part of a FRA, developers should liaise with Local Authority Emergency Planners to identify potential evacuation measures that should be taken to protect against the unlikely event of a major reservoir breach.

Developers should undertake a zone of search in the vicinity of their site to identify smaller reservoirs such as fishing lodges or mill supply ponds. The FRA should determine the ownership and maintenance regime of the reservoir and undertake a more detailed investigation into the effects of the reservoir overtopping or failing. The developer should then liaise with the LPA and reservoir owner to determine applicable emergency planning requirements or mitigation needs. Where there is significant flood hazard identified to the site from such failure and especially from unmaintained reservoirs, the developer should liaise closely with the LPA about the suitability of the site for development.

4.5.3 Groundwater

There is not a significant risk of groundwater flooding in Bury, Rochdale or Oldham but it should not be dismissed as a possibility and the FRA should consider the potential mechanisms that could affect the development site, as outlined in Volume II. If a risk of groundwater flooding is found, developers should consult with the LPA and Environment Agency at an early stage as to the next steps.

The risk of groundwater flooding should be considered when assessing suitable SUDS techniques at a strategic level. Groundwater flooding is expected to be a design issue. For example, basements should not be considered in areas at risk of flooding from groundwater rebound or in the floodplain of watercourses where there might be alluvial groundwater flooding.

4.5.4 Surface Water

This is discussed in section 4.6.

4.5.5 Sewers

Where the SFRA has identified risk from surface water flooding, any water that surcharges the sewer system would be expected to follow similar flow paths and pond in similar low spots. However, the volume of water that emerges from the system will be entirely dependent on the reason for the network surcharging (which could be due to rainfall beyond the design level of the sewer system, sewer capacity issues or blockage or failure).

Developers should take account of the guidance in section 4.6 where appropriate and liaise closely with United Utilities over any localised sewer flooding problems that could affect the site. Any known sewer flooding locations are prioritised for investment by United Utilities and may be the subject of future investment by the water company.

Future development should be designed so that it does not contribute to existing sewer flooding problems.

4.6 Drainage for New Developments

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and a consequent potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure. It should be borne in mind that the sewer network in places across the Greater Manchester area was designed to drain less development than exists today. Development has added flow over time and the network is known to be at capacity in many places. The frequent localised flooding experienced in many parts of Greater Manchester, and Radcliffe and Heywood in this study area in particular, is testament to this problem.

Managing surface water discharges from new development is therefore crucial in managing and reducing flood risk to new and existing development downstream. Carefully planned development can also play a role in reducing the amount of properties that are directly at risk from surface water flooding. The Planning System has a key role to play in settings standards for sustainable drainage from new developments and ensuring that developments are designed to take account of the risk from surface water flooding. Sustainable drainage plays an important part in reducing flows in the sewer network and in meeting environmental targets, alongside investment in maintenance and new capacity by United Utilities. United Utilities plan their investment on a five year rolling cycle, in consultation with key partners, including the Environment Agency.

Sustainable drainage and the use of Sustainable Drainage Systems (SUDS) is supported by the policy direction in Future Water[7], Making Space for Water[8], the Pitt Review[9] and the Draft Flood and Water Management Bill[10] that provides for more sustainable management of the water cycle, working in partnership across different agencies and new responsibilities for local flood risk management. In particular, the Draft Flood and Water Management Bill requires developers where practical, to include sustainable drainage in new developments to reduce flood risk and improve water quality. It includes '*a requirement on developers to demonstrate that they have met national standards for the application of SUDS techniques before they can connect any residual surface water drainage to a public sewer (amending section 106 of the Water Industry Act 1991).*' As part of their new responsibility for local flood risk management, local authorities will be responsible for approving SuDS for new developments and adopting and maintaining them.

Recognising the above, drainage from new developments should incorporate storage, with residual discharge of surface water to the following networks in order of preference:

- Infiltration drainage (e.g. soakaways)
- Discharge to a watercourse
- Discharge to a public sewer

The choice of system will be determined by local ground conditions (including groundwater levels). Whilst infiltration SUDS may be the most suitable for new development, developers must consider the risk of contamination to underlying aquifers.

The guidance below should be used in addition to the Environment Agency Standing Advice[11].

4.6.1 Development Sites in the Wider Local Authority Districts

Developers should use the following guidance regarding surface water runoff from new developments:

Allowable Discharge Rates

- Development should deliver Greenfield runoff on Greenfield sites up to a 1 in 100 year storm event, considering climate change

[7] Defra (2008) Future Water

[8] Defra, Department for Transport, HM Treasury and Office of the Deputy Prime Minister (2005) Making Space for water: Taking forward a new Government strategy for flood and coastal erosion risk management in England; First Government response to the autumn 2004 Making space for water consultation exercise

[9] The Pitt Review (2008) Learning lessons from the 2007 floods

[10] Defra (2009) Draft Flood and Water Management Bill © Crown Copyright

[11] Environment Agency. Flood Risk Standing Advice for England - PPS25 National Version 2.0. Can be accessed online at http://www.environment-agency.gov.uk/research/planning/82584.aspx

- Development should aim for a reduction in surface water runoff rates of 30% for Brownfield sites up to a 1 in 100 year storm event, considering climate change (reduction of 30% was discussed with the Environment Agency Development Team when preparing the SFRA)
- Development should be designed so that there is no flooding to the development in a 1 in 30 year event and so that there is no property flooding in a 1 in 100 year plus climate change event
- There may be local variations on this where outfalls are directly to larger watercourses and hence surface water discharges from development sites can pass downstream before the main peak on the watercourse

Wherever possible, this should be achieved through the implementation of SUDS. Source control should be considered firstly. There may be opportunities to deliver SUDS though integrated solutions for collections of strategic sites. The future ownership and maintenance of SUDS systems should be discussed at the planning application stage with the relevant sections of the LPA (including Highways and Drainage), United Utilities and the Environment Agency. More detail on SUDS is available in Appendix G.

The developer should liaise closely with the local authority drainage engineer, the Environment Agency and United Utilities to determine appropriate discharge rates. The developer should prove that surface water discharges from the site will not have an adverse impact on flood risk elsewhere, with reference to investment planning by Untied Utilities that may increase the capacity of the sewer network in the area.

Overland Flow Paths

Underground drainage systems have a finite capacity and regard should always be given to larger events when the capacity of the network will be exceeded. Hence there is a need to design for exceedance. This should be considered alongside any surface water flows likely to enter a development site from the surrounding area.

Master planning should ensure that existing overland flow paths are retained within the development. As a minimum the developer should investigate, as part of a FRA, the likely depths and extents of surface water flooding on a development site when the national Areas Susceptible to Surface Water Flooding map and/or the surface water mapping produced for the Level 2 SFRA indicate that there is a risk of surface water flooding. This is a precautionary, but an appropriate approach to reduce the risk of flooding to new developments. Green infrastructure should be used wherever possible to accommodate such flow paths. Floor levels should always be set a minimum of 300mm above adjacent roads to reduce the consequences of any localised flooding.

The effectiveness of a flow management scheme within a single site is heavily limited by site constraints including (but not limited to) topography, geology (soil permeability), development density, existing drainage networks within the site and surrounding area, adoption issues and available area. The design, construction and ongoing maintenance regime of such a scheme must be carefully defined at an early stage and a clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential.

4.6.2 Critical Drainage Areas

Certain locations are particularly sensitive to an increase in the rate of surface water runoff and/or volume from new development. There are generally known local flooding problems associated with these areas. These areas have been defined as Critical Drainage Areas (CDAs) in the SFRA. Specific drainage requirements are required in these areas to help reduce local flood risk. The SFRA has designated CDAs as high flood risk areas.

These are areas with complex surface water flooding problems that would benefit from a drainage strategy, which is most effectively done in a Surface Water Management Plan.

United Utilities sewer records were not made available for this study and it should be noted that there are likely to be additional areas that contribute flows through the sewer system into CDAs.

The CDAs provided in the SFRA should be refined over time as more detailed information on flood risk and local flood management assets, including sewered catchments, becomes available.

In these areas, a detailed FRA is required regardless of which Flood Zone that applies for all developments over 0.5 hectares. This should demonstrate that new development is not at risk from flooding from existing drainage systems or potential overland flow routes. It should also demonstrate that the development will not adversely affect existing flooding conditions by the use of

appropriate mitigation measures. The FRA should define and address the constraints that will govern the design of the drainage system and layout of the development site.

The Environment Agency Standing Advice allows developers to screen online for the level of flood risk assessment that is appropriate for a development with regard to the PPS25 Flood Zones. This highlights the need for a FRA in Flood Zones 2 and 3 and in Flood Zone 1 where there are critical drainage problems. The Standing Advice notes that for developments in Flood Zone 1 FRA Guidance Note 1[12] should be followed:

'In areas where the Local Planning Authority has identified drainage problems through a Strategic Flood Risk Assessment or Surface Water Management Plan and they have indicated that a formal flood risk assessment is required'. FRA Guidance Note 1 requires FRAs to provide 'Proposals for surface water management that aims to not increase, and where practicable reduce the rate of runoff from the site as a result of the development (in accordance with sustainable drainage principles, and the Local Planning Authority's published SFRA).'

Proposals for development in Critical Drainage Areas as defined by this SFRA should follow the guidance and standards as set out below for developments that are within any flood zone.

Allowable Discharge Rates

Development should seek to reduce existing local flooding problems and not add to them. The AGMA authorities are currently developing drainage standards for developments within Critical Drainage Areas. In the interim the following guidance should be followed:

- Development should deliver Greenfield runoff on Greenfield sites up to a 1 in 100 year storm event, considering climate change
- Development should aim for a reduction in surface water runoff rates of 50% for Brownfield sites, with an aim of reducing runoff to Greenfield rates up to a 1 in 100 year storm event, considering climate change
- Development should be designed so that there is no flooding to the development in a 1 in 30 year event and so that there is no property flooding in a 1 in 100 year plus climate change event

Over time, it is envisaged that local authorities will commission drainage strategies (see below) to determine in more detail and establish the evidence base for set reductions in surface water runoff from development sites. With regard to this, the developer should liaise closely with the Environment Agency, United Utilities and LPA as soon as possible to determine an appropriate reduction in runoff rate and volume with reference to discharge limits as laid down by any completed SWMP or drainage strategy for that area.

Wherever possible, this should be achieved through the implementation of SUDS. Source control should be considered firstly. There may be opportunities to deliver SUDS though integrated solutions for collections of strategic sites. The future ownership and maintenance of SUDS systems should be discussed at the planning application stage with the relevant sections of the LPA (including Highways and Drainage), United Utilities and the Environment Agency. This approach should be taken unless the developer can demonstrate that this is not feasible and that there will be no adverse impact caused by the development elsewhere.

This is supported by Category 4 of the Code for Sustainable Homes, which requires developers to ensure that peak run-off rates and run-off volumes will be no greater than the pre-development conditions as a minimum. However, the code recommends that attenuation of the additional flows caused by development should be related to the degree of flood risk in an area. In 'high flooding risk areas', 100% of the additional volume should be attenuated[13]. Planning Policy Statement 1[14] allows local planning authorities to stipulate high levels of the code where there are local circumstances that allow and warrant it. **The SFRA has designated CDAs as high flood risk areas**.

[12] Environment Agency. Flood Risk Assessment (FRA) Guidance Note 1, Development Greater Than 1 Hectare (ha) in Flood Zone 1 (and Critical Drainage areas less than 1ha) Can be accessed online at http://www.environment-agency.gov.uk/static/documents/Research/FRAGuidanceNote1.pdf

[13] DCLG (2006) Code for Sustainable Homes

[14] DCLG (2007) Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1

Overland Flow Paths

Developers should follow the advice on managing exceedance and overland surface water flow paths as set out in section 4.6.1.

4.6.3 Integrated Drainage

There is the potential for groups of development sites coming forward to share a central and integrated solution for managing surface water runoff. This should be investigated further through a SWMP or a Drainage Strategy, which may or may not be undertaken at the same time as a SWMP. A Drainage Strategy will be required to be prepared by the developer(s) where an integrated solution is necessary, due to issues of land constraints, geology, connection to public sewers and watercourses. Such solutions can provide great benefits besides water management, including providing Green Infrastructure enhancements, recreational facilities, improving biodiversity and making communities a better place to live. Where there are several sites that would share a communal facility, such sites may be funded through developer Section 106 or Community Infrastructure Levy payments. Early discussions with the Local Authority and Untied Utilities is essential.

Drainage Strategies can be particularly useful for considering, recommending the implementation of and long term management arrangements for SUDS and setting appropriate runoff rates from new development. They can be used to support a Supplementary Planning Document. A Drainage Strategy would include the timescales for delivering integrated solutions in line with the requirements of PPS12, having considered the delivery programmes of different operating authorities, such as United Utilities and the Environment Agency. The SWMP may identify that a surface water credit system could support such solutions (via Section 106 or Community Infrastructure Levy payments) and deliver reductions in surface water runoff from collections of sites. Such a system would work on the basis that the developer should achieve maximum reductions in runoff on site as the preferred option and in accordance with the allowable discharge rates outlined in the SFRA, as an interim until a Supplementary Planning Document is available (supported by a SWMP/Drainage Strategy). Where the allowable discharge rates cannot be achieved on site, any residual elements could be bought out to enable investments in strategic and integrated measures that reduce the amount of water in the system within a defined drainage catchment.

Drainage Strategies should be used to set surface water runoff standards for all developments within a defined drainage catchment, including considering surface water runoff from windfall sites that may come forward.

The Level 2 SFRA has made recommendations for SWMPs and Drainage Strategies.

5 FLOOD RISK MANAGEMENT

5.1 Introduction

Throughout the risk based sequential approach, the need to take a sequential approach when allocating land for development should always be kept in mind and opportunities taken to minimise flood risk at every stage of the planning process.

Mitigation measures should be seen as a last resort to address flood risk issues to new development.

Mitigation measures must be designed to provide an appropriate level of protection to a site for the lifetime of the development. At many sites it may be technically feasible to mitigate or manage flood risk. However, the potential impacts of mitigation measures on flood risk to the surrounding community must always be considered and where the depth of flooding is substantial, these mitigation measures may result in practical constraints to development with significant financial implications. There will always be a residual risk remaining that should be accounted for through effective emergency planning.

The minimum acceptable standard of protection against flooding for new property within flood risk areas is the 1 in 100 year flood event for fluvial flooding, with an allowance for climate change over the lifetime of the development.

5.2 Strategic Approach

Mitigation measures should be considered on a strategic basis that avoids a piecemeal approach and advocates partnership between the LPA and the Environment Agency and integration with wider Environment Agency flood risk management works and strategies (e.g. River Irwell CFMP, Upper Irwell Strategy).

The SFRA identified the need for a strategic vision when it comes to managing flood risk to new development. An **Outline Mitigation Strategy** has been undertaken for the following locations in the BRO SFRA Volume III section 9.

- Chamberhall and Western Waterside
- The River Irwell at Ramsbottom
- The River Irwell from the railway bridge at Warth Mills to the railway crossing downstream of the East Lancs Paper Mill
- River Roch through the East Central Rochdale and Town Centre East regeneration areas (Volume III). A preliminary review of mitigation works to deliver regeneration in Rochdale is considered in Volume IV

The Outline Flood Risk Mitigation Strategy considers the wider and cumulative impacts of mitigation and involves master-planning an area from a flood risk perspective. Developers should refer to the recommendations outlined with this strategy when considering on-site mitigation.

As a summary, taking a strategic approach requires all that are involved in flood risk management to consider:

- Avoidance of development in flood risk areas
- The sequential approach to site layout, substituting higher vulnerability development in lower flood risk areas and considering flooding from all sources
- Wherever possible, using open land or green infrastructure to reduce risk, provide compensatory flood storage or serve a sustainable drainage function
- **Adopting mitigation solutions that fit with the wider vision of the community in managing flood risk. In significant flood risk areas, developers should aim to reduce risk to the wider community as provided for in the policy aims of PPS25**
- Adopting SUDS
- Preparing emergency flood plans

5.3 Potential Mitigation Measures

Table 5-1 provides links to the evidence in the BRO SFRA Volume II and III, to identify what development could be seen as appropriate with a certain flood risk area and what mitigation measures could potentially be adopted to reduce the level of risk. As above, all mitigation measures should fit in with the wider strategic approach advocated for a community and ensure that there is no increase in flood risk to the surrounding community. The developer should liaise closely the Environment Agency and Development Management as to what mitigation measures may be suitable.

5.4 Mitigation Techniques

5.4.1 Reducing Flood Risk through Site Layout and Design

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development.

The PPS25 Practice Guide states that a sequential, risk-based approach should be applied to try to locate more vulnerable land use to higher ground, while more flood-compatible development (e.g. vehicular parking, recreational space) can be located in higher risk areas.

Waterside areas, or areas along known flow routes, can be used for recreation, amenity and environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should ensure safe access to higher ground from these areas, and avoid the creation of isolated islands as water levels rise.

The Environment Agency will have to consent to any works within 5 metres of a main river. It is likely that they will object in principle to any development within these areas.

The Royal Institute of British Architects (RIBA) have produced a guidance document *'Designing for Flood Risk'* which can aid this process. The guidance document can be found at:
http://www.architecture.com/FindOutAbout/Sustainabilityandclimatechange/Flooding/DesignGuide.aspx

5.4.2 Modification of Ground Levels

Modifying ground levels to raise the land above the required flood level is a very effective way of reducing flood risk to the site in question.

However, in most areas of fluvial flood risk, conveyance or flood storage would be reduced by raising land above the floodplain, adversely impacting on flood risk downstream. Compensatory flood storage must be provided, and should be on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain (in order for it to fill and drain). It should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated).

Where the site is entirely within the floodplain it is not possible to provide compensatory storage at the maximum flood level and this will not be a viable mitigation option. Compensation schemes must be environmentally sound.

The need for compensatory storage must been discussed at the earliest stage of planning as this will be a major constraint as this requirement may have significant implications for the yields achieved for individual sites due to the associated land take this may require.

5.4.3 Raised Defences

Construction of raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will remain. Compensatory storage must be provided where raised defences remove storage from the floodplain.

Temporary or demountable defences are not acceptable flood protection for a new development unless flood risk is residual only.

5.4.4 Developer Contributions to Flood Defences

In some cases, it may be necessary for the developer to make a contribution to the improvement of flood defence provision that would benefit both the development in question and the local community.

5.4.5 Building Design

The raising of floor levels within a development avoids damage occurring to the interior, furnishings and electrics in times of flood. If it has been agreed with the Environment Agency that, in a particular instance, the raising of floor levels is acceptable, they should be raised to 600mm above the maximum water level during a 1 in 100 year flood event plus climate change. This additional height that the floor level is raised is referred to as the 'freeboard'.

Depth maps produce in the Level 2 SFRA (Volume III) will provide an indication of the height of land raising required to lift the development out of the 1 in 100 year event plus climate change. Whilst this will provide an early indication, detailed modelling will still be required to define these levels further.

Making the ground floor use of a building water compatible (for example a garage), is an effective way of raising living space above flood levels.

Putting a building on stilts is not considered an acceptable means of flood mitigation for new development. However it may be allowed in special circumstances if it replaces an existing solid building, as it can improve flood flow routes. In these cases attention should always be paid to safe access and egress and legal protection should be given to ensure the ground floor use is not changed.

5.4.6 Resistance and Resilience

There may be instances where flood risk remains to a development. For example, where the use is water compatible, where an existing building is being changed, where residual risk remains behind defences, or where floor levels have been raised but there is still a risk in a 1 in 1000 year event. In these cases (and for existing development in the floodplain), additional measures can be put in place to reduce damage in a flood and increase the speed of recovery. These measures should not be relied on as the only mitigation method.

The 2007 document 'Improving the Flood Performance of New Buildings' provides further details on possible resistance and resilience measures[15].

Temporary Barriers

Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale temporary snap-on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.

Permanent barriers

Permanent barriers can include built up doorsteps, rendered brick walls and toughened glass barriers.

Wet-proofing

This involves designing interiors to reduce damage caused by flooding, for example:

- Electrical circuitry installed at a higher level with power cables being carried down from the ceiling rather than up from the floor level
- Water-resistant materials for floors, walls and fixtures

Resilience measures will be specific to the nature of flood risk, and as such will be informed and determined by the FRA.

5.5 Making Development Safe

5.5.1 Safe Access and Egress

The developer must ensure that safe access and egress is provided to an appropriate level for the type of development. This may involve raising access routes to a suitable level.

As part of the FRA, the developer should review the acceptability of the proposed access in consultation with the Environment Agency.

[15] Communities and Local Government (2007) Improving the Flood Performance of New Buildings – Flood Resilient Construction

For the purpose of the SFRA it is considered appropriate to provide a low hazard environment in access and egress routes associated with new housing developments. Environment Agency guidance suggests that all development should have a dry access and egress in the 1 in 100 year event.

Greater depth and velocity may be permitted where elevated and safe access / egress to safe ground are provided.

It **should** be noted that the emergency services are unlikely to regard developments that increase the scale of any rescue that might be required as being safe.

5.5.2 Flood Warning and Evacuation

Emergency/evacuation plans should be in place for all properties, large and small, at residual risk of flooding; those developments which house vulnerable people (i.e. care homes and schools) will require more detailed plans.

More information on flood plans for development is provided in section 6 of this User Guide.

5.6 Making Space for Water

5.6.1 Opportunities for River Restoration and Enhancement

All new development close to rivers should consider the opportunity presented to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

5.6.2 Opportunities for Floodplain Restoration

It is an objective of PPS25 to safeguard land from development that may be required for current or future flood management. In areas of very high flood risk there may be a strong case for allowing previously developed sites to return to Functional Floodplain in urban areas where they can act to convey and store flood water and reduce risk to current development.

5.6.3 Buffer Strips

Developers should set back development from the landward toe of fluvial defences (or top of bank where defences do not exist) and this distance should be agreed with the Environment Agency. This provides a buffer strip to ‘make space for water’, allow additional capacity to accommodate climate change and ensure access to defences is maintained for maintenance purposes.

Table 5-1: Possible mitigation measures

Flood Source	SFRA Data Source	Risk Zone	Appropriate Development [1]	Comments	Possible Mitigation
Fluvial Depths and Hazards	**BRO SFRA Volume II** Map 1.2 (A to Q) Map 1.6 (A to O) **BRO SFRA Volume III** Maps 2.1 to 2.16 Maps 3.1 to 3.16	Flood Zone 1	EI, WC, HV, MV and LV	All development is viable within Flood Zone 1; however other sources of flooding should be investigated.	None required for fluvial but may be for other sources. Refer specifically to CDAs.
		Flood Zone 2, <0.3m depths and/or Very Low Hazard	EI, WC, HV, MV and LV	Low depth and hazards can be manageable with minor mitigation required	Sequential approach to site layout.
		Flood Zone 2, >0.3 depths, Dangerous for some and/or Dangerous for all	EI, WC, MV and LV	All development must be designed to remain safe up to the 1 in 100 + climate change event, however residual risks must be considered if the development is situated behind defences.	Sequential approach to site layout. Raising floor levels may be a possibility. Additional measures can be put in place to reduce damage to existing properties and increase the speed of recovery (i.e. temporary and permanent barriers and wet-proofing). These measures should not be relied on as the only mitigation method. Emergency planning must be considered and safe access and egress routes should be identified.
		Flood Zone 3, 0.3–1m depths and/or Dangerous for some	EI, WC, MV and LV	Sustainable mitigation and flood risk management may be feasible for both housing and employment purposes. There is a greater likelihood of passing the Exception Test. Areas may still have residual risks	Sequential approach to site layout. Raising floor levels is acceptable and they should be raised to 600mm above the maximum water level during a 1 in 100 year flood event plus climate change. Compensatory flood storage must be provided, and should be on a level for level, volume for volume basis. Emergency planning must be considered and safe access and egress routes should be identified.
		Flood Zone 3, 1–1.5m depths and/or Dangerous for most	EI, WC and LV	Mitigation is likely to be costly and may not be economically justifiable for low value land uses. Housing allocations are not suitable. The likelihood of passing the Exception Test is lower.	Floor level raising for employment purposes is unlikely to be economically viable and employment allocations should be reconsidered in favour of alternative lower risk sites. Emergency planning must be considered and safe access and egress routes should be identified. Opportunities for floodplain and river restoration and/or buffer strips should be investigated.

Flood Source	SFRA Data Source	Risk Zone	Appropriate Development [1]	Comments	Possible Mitigation
		Flood Zone 3, >1.5m depths and/or Dangerous for all	None	Flood risk mitigation measures are unlikely to be economically justifiable and all development should be avoided. Development is unlikely to be sustainable and the likelihood of passing the Exception Test is low.	Large mitigation schemes would be required including raised defences. However, this is not a preferred option, as a residual risk of flooding will remain. Compensatory storage must be provided where raised defences remove storage from the floodplain. Emergency planning must be considered and safe access and egress routes should be identified. Opportunities for floodplain and river restoration and/or buffer strips should be investigated.
Surface Water	**BRO SFRA Volume II** Map 1.4 (A to O) Map 1.7 (A to D) **BRO SFRA Volume III** Maps 1.1 to 1.6	High, Medium and Low Critical Drainage Areas	EI, WC, HV, MV and LV	Although surface water flooding will not directly impact on the spatial allocation of development, it should be considered within site layout. Surface water will also need to be controlled on site.	Opportunities should be sought to open up land were surface water is expected to flow or pool. SUDS should also be adopted to reduce risk on site and to the surrounding community by first storing water and managing run-off rates. The additional guidance for developing in CDAs should be considered if appropriate.
Canals	**BRO SFRA Volume III** Maps 5.1 to 5.4	Direct and Indirect	EI, WC, HV, MV and LV	Flood risk from canals is residual. Although this will not directly impact on the spatial planning of development, it should influence building design and finished flood levels.	The risk of canals should be mitigated through increasing the freeboard of proposed development finished floor levels. Volume III has identified the possible increase in flood level if a breach occurs. If a development is situated directly adjacent to a canal, flood warning would not be beneficial as breaching would be sudden. However, raising the awareness of the risk is critical.
Reservoirs	**BRO SFRA Volume II**	-	EI, WC, HV, MV and LV	Flood risk from reservoirs is residual. Although this will not directly impact on the spatial planning of development, it should influence site emergency planning. Smaller reservoirs could potentially pose the greatest risk.	The risk of flooding should be assessed as part of the FRA. Smaller reservoirs should be assessed to identify the risk and appropriate mitigation put in place.

[1]EI = Essential Infrastructure, WC = Water Compatible, HV = Highly Vulnerable, MV = More Vulnerable, LV = Less Vulnerable

Check with Table D.3 of PPS25 to see if Exception Test is required.

6 GUIDANCE FOR EMERGENCY PLANNERS

The aim of this section is to provide guidance on the use of the SFRA by Emergency Planners. Developers should also refer to the guidance on SFRA maps provided on page vi and background to the SFRA and flood risk concepts in Appendix A and C.

Emergency Planners should use the guidance in this SFRA User Guide, PPS25 and its Practice Guide to:

- ***Update Multi-agency Flood Plans***
  - *Using the overall assessment of flood risk provided in the Level 1 SFRA*
  - *Using the assessment of residual risk in the Level 2 SFRA*
- ***Provide advice on developer Flood Plans for new development***
  - *Using outputs from the Level 1 and Level 2 SFRAs*
- ***Raise awareness of flood risk from all sources***
  - *Using outputs from the Level 1 and Level 2 SFRAs*

6.1 Introduction

This section provides guidance on how Local Authority Emergency Planners can use the outputs of the SFRA to update Multi-agency Flood Plans and provide advice on Flood Plans written by developers for new development.

6.2 Emergency Planning Overview

Under the Civil Contingencies Act (2004) Bury, Rochdale and Oldham Councils are classified as a category 1 responder. During an emergency such as a flood event, coordination with the other category 1 responders (including the emergency services and the Environment Agency) is essential to guarantee the safety of residents. Under the Civil Contingencies Act, the Local Authority holds a statutory duty to provide civil protection to their communities to ensure human welfare, environmental stability and UK security are not affected. Under the Act, risk assessments and planning is arranged through Local and Regional Resilience Forums (LRF/RRF). Bury, Rochdale and Oldham Councils are part of the Greater Manchester Resilience Form (GMRF).

(http://www.gmep.org.uk/ccm/navigation/greater-manchester-resilience-website/)

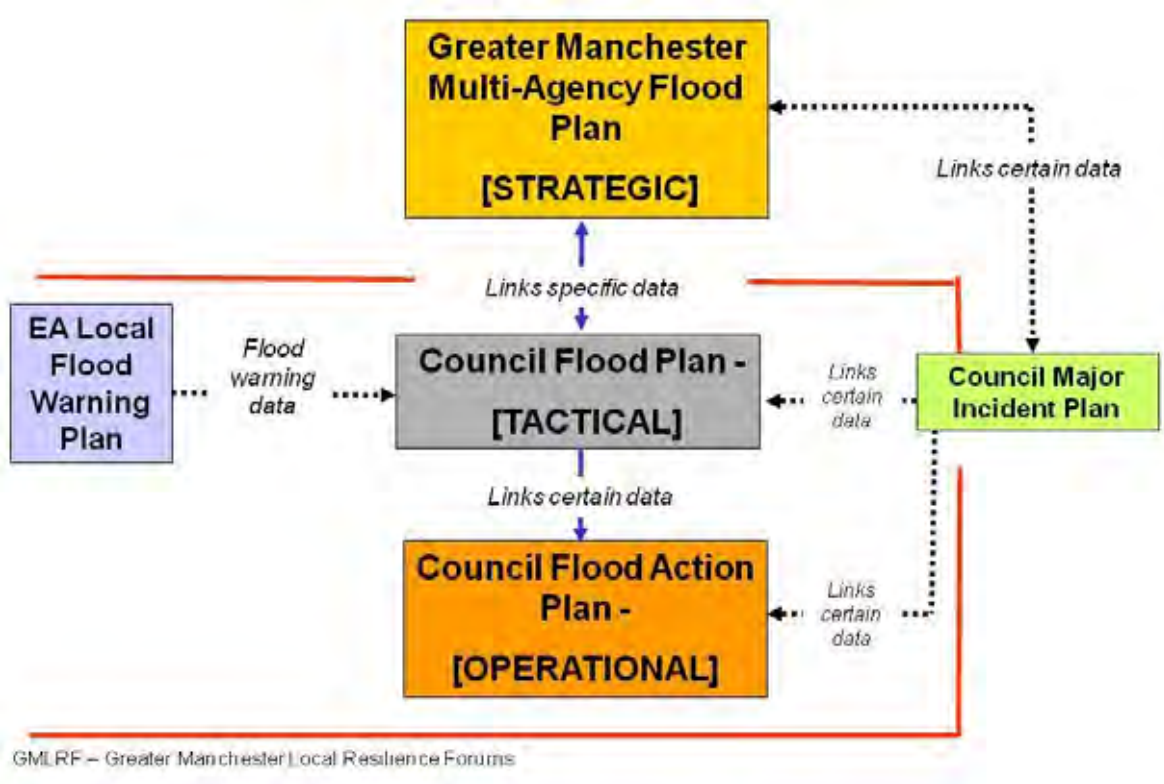
GMRF's overall purpose is to ensure that there is an appropriate level of preparedness to enable an effective multi-agency response to emergency incidents that may have a significant impact on the communities of Greater Manchester. Strategic decision-making and resource allocation are determined by reference to the Greater Manchester Community Risk Register (CRR), which considers the likelihood and consequences of the most significant risks facing Greater Manchester over the next 5 years.

The aim of the SFRA so far has been to try and avoid development in flood risk areas in the first instance. However, it has also been accepted that there is current development in flood risk areas and there will need to be a level of continued regeneration. Minimising flood risk to people, property and the environment should be considered. Flood defences go some way in reducing the current flood risk by providing a standard of protection, however there is still a residual risk associated with them as they can be overtopped or breached. Flood Warnings is an integral part of flood risk management, for which the Environment Agency are the lead authority responsible for warning the public, local authorities and emergency services.

Along with the Environment Agency Flood Warning systems, there are a range of Flood Plans at a regional and local level, outlining the major risk of flooding and the tactical and operation plan for key responders. These plans are incorporated in Local Authority Major Incident Plans. Figure 6-1 identifies the links between Environment Agency Flood Warning data and regional and local Flood Plans.

This SFRA contains useful data to allow emergency planning processes to be tailored to the needs of the area and be specific to the flood risks faced. The detailed maps and GIS layers provided should be made available for consultation by emergency planners during an event.

Figure 6-1: Local and Regional Flood Plans



6.3 Flood Plan Recommendations

The BRO SFRA Volume II and III provide a number of flood risk data sources that should be used when producing or updating flood plans.

Plans currently in place or under preparation in Bury, Rochdale and Oldham include:

1. Environment Agency Flood Warning Plan
2. Greater Manchester Multi-Agency Flood Plan (draft)
3. Bury Council Operational Flood Response Plan (2008)
4. Rochdale Draft Multi-Agency Flood Response Plan (2008)
5. Oldham Emergency Management Plan (2007)

The data in the SFRA can be used to update these Flood Plans and the Local Authority Emergency Planners are advised to:

- Consider and understand the possibility, likelihood and spatial distribution of all sources of flooding, including fluvial, tidal, surface water and sewer, man-made bodies of water including canals and reservoirs and groundwater flooding, as discussed in the Level 1 SFRA (Volume II) and associated mapping for reports. Relevant sections and maps include:
    - Understanding the risk from different sources of flooding (Volume II section 2)
    - Flood zone maps
    - Areas Susceptible to Surface Water Flooding maps

Note that more detailed surface water maps are available for Littleborough, Heywood, Ramsbottom, Radcliffe, Derker and Sholver. These are provided as part of the Level 2 SFRA.

- Climate change maps
- Flood depth maps

- Consider and understand the residual risk associated with flood risk management infrastructure and the management of manmade bodies of water using the information provided in the BRO SFRA Volume III.
  - Flood defences, overtopping or breaching – Volume II (section 2 and 3), which also consider climate change
  - Canal overtopping or breach – Volume II (section 4)
  - Refined surface water maps for Littleborough, Heywood, Ramsbottom, Radcliffe, Derker and Sholver – Volume II (section 5)
- Use the data in the BRO SFRA Volume II and III to:
  - Update the final Greater Manchester Multi-Agency Flood Plan and update to each Local Authority Flood Plan to reflect the above findings
  - Consider the need for evacuation plans for existing vulnerable institutions in the floodplain and other areas at high flood risk
  - Consider reviewing and updating safe evacuation routes and access routes for emergency services from any existing area of flood risk to rest centres, avoiding routes that may be flooded
  - Review the Greater Manchester Community Risk Register (CRR)

6.4 Planning Approval – Flood Plans including Flood Warning

As a condition of planning approval flood evacuation plans should be provided by the developer which aim to safely evacuate people out of flood risk areas, using as few emergency service resources as possible. These plans should detail any prearranged emergency arrangements including dry evacuation routes, flood warning, location of rest centres and safe havens. It is recommended that any flood evacuation plan written is forwarded onto Bury, Rochdale or Oldham Councils as appropriate and the Environment Agency for review. The plan owner must put in place the plan if the development goes ahead and liaise with the council regarding long-term maintenance and updating of the plan.

It should be noted that the emergency services are unlikely to regard developments that increase the scale of any rescue that might be required as being safe.

According to the PPS25 Practice Guide, flood warning and evacuation plans should include the information highlighted in Table 6-1. The table also provides links to data provided in the BRO SFRA Volume II and III which should be used to inform their preparation. More detailed analysis should be done within a site-specific FRA that should inform these plans.

Table 6-1: Flood Warning, Evacuation Plans and SFRA evidence

How flood warning is to be provided	BRO SFRA Evidence
Availability of existing flood warning system	Volume II Map 1.3
Rate of onset of flooding	Volume III Animations
How flood warning is given	-
What will be done to protect the development and contents	**BRO SFRA Evidence**
How easily damaged items will be relocated	-
The availability of staff/occupants/users to respond to a flood warning	-
The time taken to respond to a flood warning	-
Ensuring safe occupancy and access to and from the development	**BRO SFRA Evidence**
Occupants awareness of the likely frequency and duration of flood events	Volume II Map 1.2
Designing and location of safe access routes	Volume III Map 2.1-3.16
Preparing evacuation routes	Volume III Map 2.1-3.16
Identify safe locations for evacuees	Volume III Map 6.1-6.3
Vulnerability of occupants	Volume I Appendix F
Expected time taken to re-establish normal use following an event	-

Please see pages vi for map references

6.5 Flood Awareness

Emergency Planners should also use the outputs from the BRO SFRA Volume II and III to raise awareness within local communities. This should include raising awareness of measures that people can take to make their homes more resilient to flooding from all sources and encouraging all those at fluvial flood risk to sign up to the Environment Agency's Floodline Warnings Direct service.

APPENDICES

Appendix A: - Flood Risk Concepts

A.1 FLOOD RISK CONCEPTS

A.1.1 Introduction

Flooding is a natural process and can happen at any time in a wide variety of locations. Flooding is a temporary covering of land not normally covered by water and presents a risk when people, human and environmental assets are present in the area which floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and the environmental and cultural heritage.

Climate change predictions are that flood risk will increase due to more frequent severe storms bringing higher intensity rainfall and increasing run-off from land and buildings. This will cause rivers and streams to experience higher than normal flood flows and levels, and sewers and drains to surcharge more frequently than at present. The focus of activity in meeting these challenges will in future be on flood risk management as opposed to simply providing flood defences. It is now widely recognised that whilst we can't always prevent flooding occurring, we can manage the risks of it happening and reduce the consequences when flooding does happen.

All operating authorities should aim to manage flood risk through a variety of measures including:

- Directing development away from flood risk areas wherever possible
- Ensuring planning activities locate vulnerable land uses away from high flood risk areas
- Providing flood warning and emergency planning activities in flood risk areas
- Generally raising awareness of flood risks amongst vulnerable communities
- Constructing and maintaining appropriately designed surface water sewers and culverts
- Using temporary and demountable flood defences and various flood prevention systems to buildings where appropriate
- Constructing new flood defences where they are sustainable, and improving and maintaining those already existing
- Constructing weirs, sluices and other flood flow control/management structures

Pro-active land use planning has a key role to play in flood risk management as it is one of the few activities that can result in the avoidance of flood risk as opposed to other activities that can only aim to reduce it. Effective flood risk management through the planning system is achieved through a hierarchy where:

- **Avoidance** of inappropriate development in high risk zones must take priority, before
- **Substitution** of lower vulnerability uses where avoidance is not possible is considered. Only if avoidance and substitution are not possible
- **Control and Mitigation** of the risks by implementing flood risk management measures through a variety of techniques to reduce the impact and mitigate residual risks.

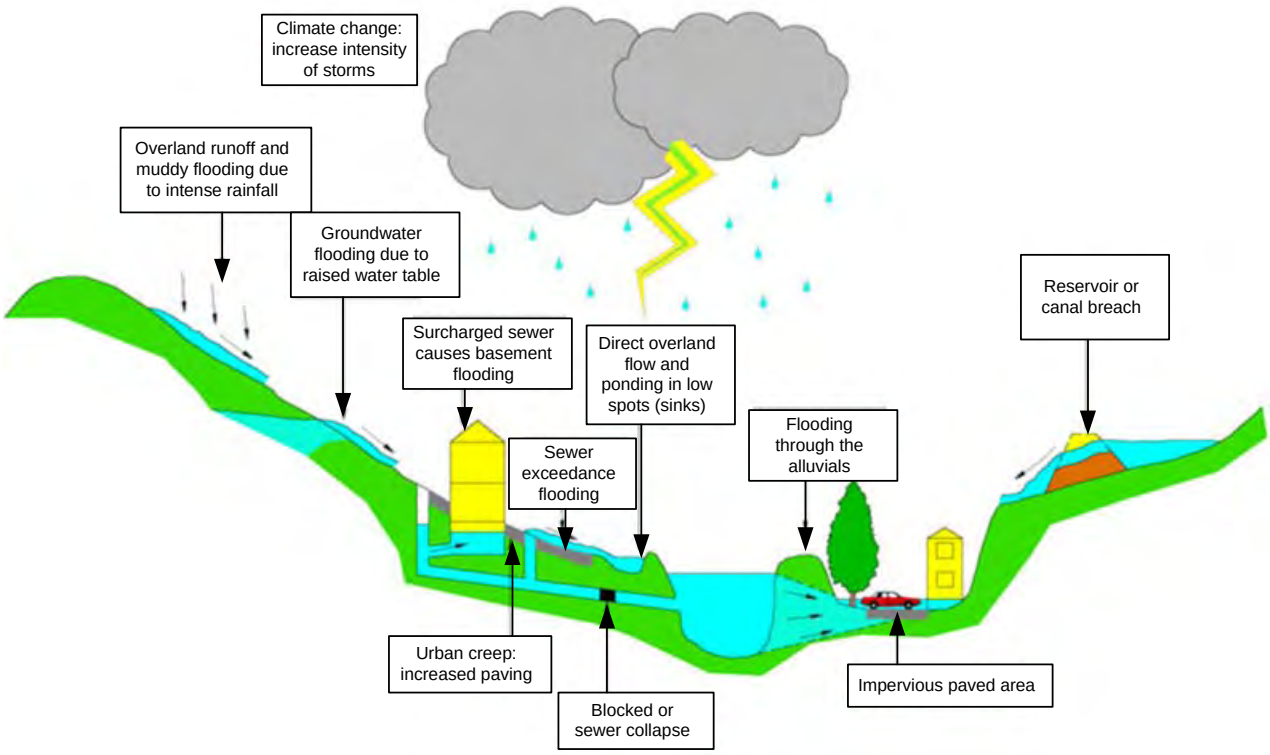
Flood risk assessment at all levels of planning and for all major developments is critical to inform decision making by planners and developers.

A.1.2 Sources of Flooding

Flooding can occur from many different and combined sources and in many different ways. Different types and forms of flooding present a range of different risks and the flood hazard, since the speed of inundation, depth and duration of flooding can vary greatly. See Figure A1 below.

With climate change, the frequency, pattern and severity of flooding are expected to change and become more damaging.

Figure A1: Flooding from all sources



Major causes of flooding include:

Fluvial Flooding

Flooding from watercourses is associated with the exceedance of channel capacity during higher flows. The process of flooding from watercourses depends on a number of catchment characteristics including: geographical location, variation in rainfall, steepness of the channel and surrounding floodplain and infiltration and rate of runoff (linked to land use i.e. degree of urbanisation). It is possible to generalise catchments into; large and relatively flat or small and steep, the two giving very different responses during large rainfall events.

According to PPS25, *"in a large, relatively flat catchment, flood levels will rise slowly and natural floodplains may remain flooded for several days, acting as the natural regulator of the flow. In small, steep catchments, local intense rainfall can result in the rapid onset of deep and fast-flowing flooding with little warning. Such "flash" flooding, which may only last a few hours, can cause considerable damage and possible threat to life."*

The form of the floodplain, either natural or urbanised, can influence flooding from watercourses. The location of buildings and roads can significantly influence flood depths and velocities by altering flow directions and reducing the volume of storage within the floodplain. Critical structures such as bridge and culverts can also significantly reduce capacity creating pinch points within the floodplain. These structures are also vulnerable to blockage by natural debris within the channel or by fly tipping and waste.

Surface Water Flooding

Flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours and follows natural valley lines, creating flow paths along roads and through and around developments and ponding in low spots, which often coincide with fluvial floodplains in low lying areas. Hence any area at risk of fluvial flooding will almost certainly be at risk of surface water flooding.

Flooding in urban areas can also be attributed to sewers. Sewers are normally designed to a maximum of a 1 in 30 year design standard and hence sewer flooding problems will often be associated with more frequent storm events, when sewers can become blocked or fail. In the larger events that are less frequent but have a higher consequence, surface water will exceed the sewer

system and flow across the surface of the land, often following the same flow paths and ponding in the same areas as overland flows.

Both 'Making Space for Water' and 'Future Water' recognise the importance of integrated urban drainage and the summer flooding of 2007 highlighted that surface water flooding can cause mass distress, damage and disruption. The Foresight Report (2004) estimated that 80,000 properties are at very high risk from surface water flooding (1 in 10 chance of occurring in any one year).

Groundwater Flooding

There are several mechanisms which produce groundwater flooding[16], these include:

- Flooding resulting from prolonged rainfall - this is associated with, but not particular to, Chalk Aquifer areas
- Flooding resulting from high in bank river levels - a particular problem in very large river basins with a large catchment, long flood durations and wide valleys with extensive alluvial deposits. Occurs in situations where the in bank river water level is at a higher elevation than the surround floodplain
- Flooding resulting from artificial obstructions – can exacerbate groundwater flooding within floodplains by placing artificial obstructions such as foundations into the ground: creating impermeable boundaries, damming groundwater up gradient and causing the groundwater levels to rise
- Flooding resulting from groundwater rebound - groundwater levels in an area can be kept artificially depressed through groundwater abstraction; if these activities are stopped, groundwater will rise or 'rebound' to their natural level. This rise in groundwater levels may cause once dry spring lines to start discharging groundwater
- Flooding resulting from mine water rebound - When mine dewatering ceases, mine water levels rise as water enters the system through mine entries and permeable strata. As levels rise, mine water can start to issue from previously dry adits, shafts etc., as increased water levels allow water to flow from sections and subterranean 'ponds' that were previously unconnected, forming new pathways and discharge points in the mine system

The occurrence of groundwater flooding is usually very local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can persist for a long period and cause significant damage to property, especial in urban areas, if not considered in development planning. In most cases groundwater flooding cannot easily be eliminated although the impact on buildings can be mitigated to some extent through various measures.

Flooding from Drainage Systems

Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its discharge capacity, it becomes blocked or it cannot discharge due to a high water level in the receiving watercourse;

Foul sewers and surface water drainage systems are spread extensively across the urban areas with various interconnected systems discharging to treatment works and into local watercourses.

Typically foul systems will comprise a network of drainage sewers, sometimes with linked areas of separate and combined drainage, all discharging to sewage treatment works. Combined Sewer Overflows (CSOs) provide an overflow release from the drainage system into local watercourses or surface water systems during times of high flows.

Surface water systems will typically collect surface water drainage separately from the foul sewerage and discharge directly into watercourse.

A major cause of sewer flooding is often due to the connection of surface water drains to discharge into the combined sewer systems. Sewer capacity can then become an issue in large rainfall events causing the backing up of flood waters internally within properties or discharging through manholes.

Insufficient capacity can also become an issue where urban areas develop over time, with improved sewerage infrastructure provision not always provided to accommodate the additional flows.

[16] Environment Agency (2007) Making Space for Water: Groundwater Flooding Records Collation, Monitoring and Risk Assessment (Reference HA5)

English and Welsh water companies are required to maintain a register of flooding incidences due to hydraulic capacity problems on the sewage network. This database identifies properties where flooding has occurred on a frequency of 1 in 5 years and 1 in 10 years. The database is known as DG5 and DG10 registers. A register for 1 in 20 years is also recorded which includes properties under investigation.

Whilst this data can give an idea of those areas with limited drainage capacity, it must be acknowledged that it is a register of properties that have flooded due to the hydraulic inadequacies of the sewer systems, not properties at risk of flooding. Therefore it has limiting usefulness in predicting future flooding.

Data generated using hydraulic network models such as InfoWorks potentially provides a very useful tool with which to predict more widespread potential for sewer flooding and the use of such tools should be investigated during a Surface Water Management Plan.

Flooding from Reservoirs

Reservoirs can be a major source of flood risk, as experienced during the 2007 summer floods, where 18 reservoirs were affected across England. Whilst the probability of dam failure or breaching occurring is very small, the consequences of such an event can be devastating thereby presenting a risk of flooding which has to be considered.

Flooding from reservoirs is noted as an issue within the Pitt Review Recommendations and acknowledged by Hilary Benn, the Secretary of State for Environment, Food and Rural Affairs. £1million has been pledge to improve reservoir safety specifically to produce inundation mapping for all reservoirs falling under the Reservoirs Act (i.e. those with a capacity of over 25,000m^3).

Reservoirs are classified on a consequence of failure basis outlined below in Table A1 and it is now suggested that a better risk-based approach to reservoir safety is needed, focusing on those reservoirs that pose the greatest risk to the public, even if they are not currently covered by the Act.

Table A1: Reservoir Consequence Classification

Dam Category	Potential Consequence of Reservoir Failure
A	At least 10 lives at risk and extensive property damage
B	Fewer than 10 lives at risk or extensive property damage
C	Negligible risk to human life but some property damage
D	Negligible risk to human life and very limited property damage

The Environment Agency is currently producing simplified inundation maps for all reservoirs under the Reservoirs Act as required by Recommendation 57 of the Pitt Review. Trial projects have been run in the North West to develop the specification for these maps and the Environment Agency will be producing maps for all reservoirs under the Act during 2009.

The Water Act 2003, which amended the Reservoirs Act 1975, requires all reservoir undertakers to prepare Flood Plans for those reservoirs where the dam failure could put people's lives at risk or lead to major damage. These plans are expected to become available in late 2009.

The reservoir Flood Plans will include:

- An inundation analysis to identify the extent and severity of flooding which could result from an uncontrolled release of water (i.e. breaching or failure)
- An on-site plan setting out what the undertaker would do in an emergency to try and to contain and limit the effects of the incident
- A communications plan with external organisations, mainly the emergency services

Defra is currently funding a project to produce a 'Guide to Emergency Planning for UK Reservoirs', which will ultimately use the Flood Plans.

Until the new Water and Floods Bill is implemented it is unclear how reservoir safety, flood risk from breach and planning will be dealt with. In the meantime any allocations or applications for development immediately downstream of a reservoir should be considered carefully in liaison with the Environment Agency. It should be noted that the hazard is well managed through legislation and it is unlikely that the impact zone downstream of a reservoir would be a reason to stop permitted development. It is likely that the flood risk would be mitigated through emergency planning.

Flooding from Canals

Canals are artificial navigable watercourses, many of which date back to the 18th century. In many places they are embanked and raised above the surrounding land. Locks on canals help pass boat traffic up and down slopes. Canals are fed from reservoirs and watercourses and have overflow structures that pass water out of the canal when levels are high to lower level watercourses. Many of the inflow and outflow structures on canals are over 200 years old when they were designed to a 'rule of thumb'.

Flooding from canals can be caused by a variety of circumstances:

- During times of high flows in feeder watercourses, excess water can enter canals
- Reservoir failure could divert excess water into a canal
- Canals can intercept surface water running off from higher ground
- Surface water or excess water in a culverted watercourse that crosses under a canal can build up behind an embanked section of canal, which then causes the canal to fail or excess water to enter a canal
- The clay lining of a canal could fail, resulting in failure of an embanked section, dependent on local geology – relatively permeable materials such as sand are more prone to failure than impermeable clay

In the event that a canal does fail, the height that the canal is elevated above surrounding land will affect to some degree the amount of flood hazard that could be caused by deep or fast flowing debris laden water, alongside the cause of failure (there will be a greater volume of water from failures caused by water building up behind an embankment). The amount of water that can escape depends on the pound length, which is the distance between two locks because the maximum volume of water that will outflow will be contained between the two locks. Hazard from canal failure is likely to be lower than that from river defences that fail, due to the limited volume of water and the longer time that it takes water to drain linearly towards the location of failure. The risk of flooding from canals is reduced by regular inspection by British Waterways or others to identify any problems with inflow and outflow structures, canal lining or embankments.

Defence Failure

The condition of existing flood defences is an important consideration for local authority planners when allocating new development. PPS25 considers that defended areas (i.e. those areas that are protected to some degree against flooding by the presence of a formalised flood defence) are still at risk of flooding, and therefore sites within these areas must be assessed with respect to the adequacy of the defences.

The condition of existing defences is provided in the form of a 'rating' (1 to 5), and is a reflection of any signs of 'obvious' structural problems. The condition rating is determined on the basis of visual inspection, focussing on obvious signs of structural defect (e.g. slippage, cracking, poor maintenance), designed to inform the maintenance programme. The Environment Agency's National Flood and Coastal Defence Database (NFCDD) condition ratings are shown in Table A2.

Table A2: NFCDD condition ratings for flood defences

Condition Rating	Condition	Condition Description
1	Very Good	Fully serviceable.
2	Good	Minor defects.
3	Fair	Some cause for concern. Requires careful monitoring.
4	Poor	Structurally unsound now or in the future.
5	Very Poor	Completely failed and derelict.

The condition of existing flood defences and whether they will continue to be maintained and/or improved in the future, is an issue than needs to be considered as part of the risk based sequential approach and in light of this, whether proposed land allocations are appropriate and sustainable. In addition, detailed FRAs will need to explore the condition of defences thoroughly, especially where these defences are informal and contain a wide variation of condition grades.

Defences that are not in good condition could be prone to failure during a flood event. Defences that offer a low standard of protection are likely to overtop during flood events that are more extreme than the event that they were designed to protect against. Flood risk associated with defence infrastructure is residual; however, the risks can be significant due to sudden onset and velocities reached by flood waters should a defence overtop or fail.

Flood Warning

The Environment Agency has the lead role in providing flood warnings in England and Wales. The aim of the flood warning service is to reduce risk to life, distress to people and damage to property caused by flooding by providing accurate, timely flood warnings to residents within the floodplain of rivers, estuaries and coasts; to the media and partner organisations.

It is crucial that people at risk receive appropriate flood warnings and take action to protect themselves and their property. Within the Environment Agency corporate plan "Creating a Better Place[17]" the Agency has highlighted three main targets:

- To have 80% of properties at risk in the floodplain in England and Wales receiving an appropriate flood warning service
- 75% of people who live in flood risk areas take appropriate action by 2011
- To have major incident plans in place for high flood risk areas

Currently the Environment Agency operates a flood warning service in specific locations known as "Flood Warning Areas" where "Flood Warning Codes" are assigned based on the overall impact of flooding within an area.

These include:

Flood Watch		*"flooding of low-lying land and roads is expected"*
Flood Warning		*"flooding of homes and businesses is expected"*
Severe Flood Warning		*"severe flooding is expected"*
All Clear		*"all clear or receding floodwaters"*

The flood warnings are used to reduce the overall impact of flooding of people and property by lowering the vulnerability of the receptor. This is done by providing a warning which can then be used to remove people at risk or to relocate valuable possession to higher levels.

In response to the summer 2007 floods, the Pitt Review stated that the Environment Agency flood warning service needed to be improved to stimulate a more effective response from response agencies and the general public.

In order to tackle these issues the Environment Agency set-up the Flood Warning Service Improvements Project (FWSIP) in December 2008. The project had three objectives:

- To implement new public flood warning codes, which are adaptable for all sources of flooding and are effective at promoting action by people to reduce the impact of floods on their lives and livelihoods,
- To develop an integrated service which provides professional partners with greater access to expert advisors during an event and a rationalised set of messages/alerts/warnings from the Met Office, Flood Forecasting Centre and the Environment Agency and

[17] Environment Agency (2006) Creating a Better Place: Corporate Strategy 2006-2011

- To make the Environment Agency river level information available to the public on the internet.

The biggest change will be the development of new public warning codes. These include

- **Flood Alert** – "Flooding is possible. Be prepared."
- **Flood Warning** – "Flooding is expected. Immediate action required."

These new public warning codes will be put into effect from spring 2010.

Overview

Flooding in urban areas can come from a variety of sources and when flooding occurs it is often not clear where the water has come from. The draft 'Flood and Water Management Bill' defines local flood risk, for which local authorities will have a local leadership role, as the risk of flooding from ordinary watercourses (smaller watercourses that are not under the jurisdiction of the Environment Agency), surface water and groundwater.

Prior to the major flood events in summer 2007, the understanding of non Main River flooding was based on anecdotal evidence or described within Critical Ordinary Watercourse (COW) investigations undertaken by the Environment Agency. Little data could be abstracted from the water companies on sensitive drainage catchments where runoff impacts of new development could be significant on combined sewer systems. However, a significant proportion of recent flood insurance claims are due to flooding from non Main River sources, so this issue will become larger with climate change.

Historically the adopted approach in many SFRAs has been not to consider other sources of flooding as a spatial or strategic issue.

Summer 2007 provided a stark reminder that the significance of capacity exceedance of artificial and natural drainage systems can be severe for many communities. Therefore a clear example was provided that flooding from all sources should be scoped into a SFRA and they should be taken into account through the planning system, and that new methods of rapid screening of these risks are required. On the back of the Pitt review, the Environment Agency has prepared a national map showing areas susceptible to surface water flooding. This was developed by JBA from research for the Making Space for Water programme and has been used within this SFRA.

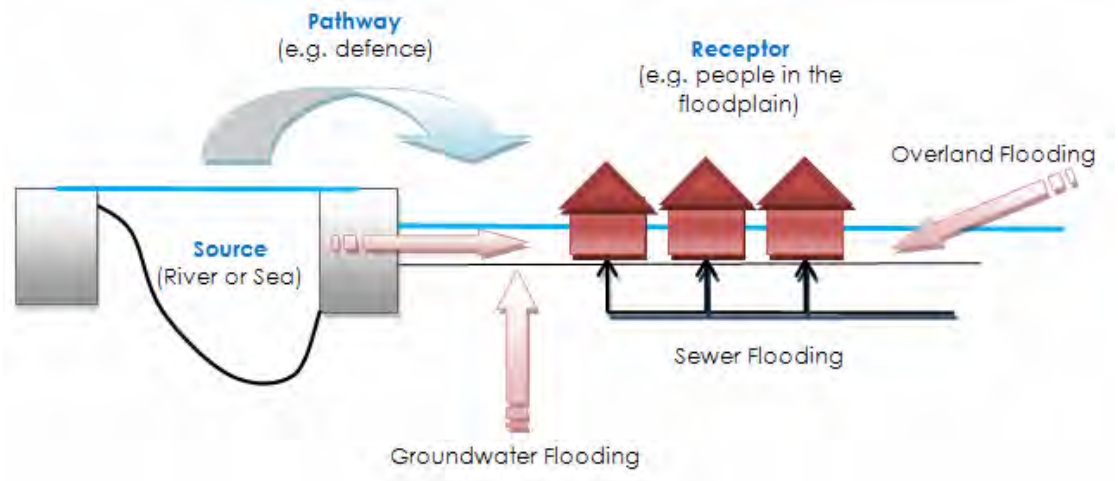
Development can increase flood risk elsewhere in the following ways:

- Upstream by restricting the capacity and conveyance function of the watercourse and floodplain system
- Downstream by decreasing the volume available for flood storage on the floodplain, altering flow routes on the floodplain or by changes to the channel which can increase the flow discharged to downstream locations
- By increasing run-off from reduced permeability surfaces, such as roads, roofs and car parks

A.1.3 Flooding Likelihood and Consequence

Flood risk is generally accepted to be a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the **source – pathway – receptor** model as shown in Figure A2 below. This is a standard environmental risk model common to many hazards and should be starting point of any flood-risk assessment. However, it should be remembered that flood risk can occur from many different sources and pathways and not simply those shown in the simple form below.

Figure A2: Source – Pathway – Receptor Model



The principal **sources** are rainfall or higher than normal sea levels, the principal **pathways** are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets and the **receptors** can include people, their property and the environment. All three elements must be present for flood risk to arise. Mitigation measures have little or no effect on sources of flooding but they can block or impede pathways or remove receptors.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk.

It is important to define the components of flood risk in order to apply this guidance in a consistent manner. Flood risk is a combination of the likelihood of flooding and the potential consequences arising.

Likelihood

Likelihood of flooding is normally expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates the flood level that is expected to be exceeded on average once in 100 years, i.e. it has a 1 in 100 chance of occurring in any one year.

Considered over the lifetime of development, such an apparently low-frequency or rare flood has a significant probability of occurring. For example a 1% flood has a 22% (1 in 5) chance of occurring at least once in a 25-year period (the period of a typical residential mortgage) and a 53% (1 in 2) chance of occurring in a 75-year period (a typical human lifetime).

Consequence

The consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure, of the population, presence and reliability of mitigation measures etc).

Flood risk

Flood risk is normally expressed as:

Flood risk = Probability of flooding x Consequences of flooding

A.1.4 Flooding Impacts on People, Property and the Environment

Flood impacts maybe direct or indirect, immediate or long term and may affect households and communities, individuals as well as the environment, infrastructure and economy of an area.

Flooding Impacts on People

Flooding has a wide range of social impacts which may be difficult to delineate as they are interconnected, cumulative and often not quantifiable.

In small urban or steep upland catchments which have a very rapid response to rainfall, or with flooding due to infrastructure failure, flood waters can rise very quickly and put life at risk. Even shallow water flowing at 2m/s can knock children and many adults off their feet and vehicles can be moved by water of 300mm depth. The risks rise if the flood water is carrying debris.

Hazards associated with flood risk to people were investigated by the Environment Agency in which a flood hazard formula was proposed in Phase 2 of the Risks to People Project[18]:

Flood hazard = d (v+0.5) +DF

The output of this formula can be categorised and coloured in accordance to current guidance[19] as described in Table A3 below:

Table A3: Flood hazard rating

Flood Hazard Rating	Hazard to People	Colouring
0	**No Hazard**	
0 to 0.75	**Very Low Hazard**	
0.75 to 1.25	**Dangerous for some**	
1.25 to 2.0	**Dangerous for most**	
Over 2.0	**Dangerous for all**	

The impact on people as a result of the stress and trauma of being flooded, or even of being under the threat of flooding, can be immense. This also extends to whole communities. Long-term impacts can arise due to chronic illnesses and stress. Flood water contaminated by sewage or other pollutants (e.g. chemicals stored in garages or commercial properties) is particularly likely to cause such illnesses, either directly as a result of contact with the polluted flood water or indirectly as a result of sediments left behind.

The degree to which populations are at risk from flooding is therefore not solely dependent upon proximity to the source of the threat or the physical nature of the flooding. Social factors also play a significant role in determining risk. Although people may experience the same flood, in the same area, at the same time, their levels of suffering are likely to differ greatly as a result of basic social differences. These differences will affect vulnerability in a variety of ways including and individuals or community's response to risk communication (flood warning) and physical and psychological recovery in the aftermath of a flood. How individuals and communities experience the impact will also vary depending on their awareness of the risk of flooding, preparedness for the flood event and the existence or lack of coping strategies.

Flooding Impacts on Property

Flooding can cause severe property damage. Flood water is likely to damage internal finishes, contents, electrical and other services and possibly cause structural damage. The physical effects can have significant long-term impacts, with re-occupation sometimes not being possible for over a year. The costs of flooding are increasing, partly due to increasing amounts of electrical and other sophisticated equipment within developments.

The damage flooding can cause to businesses and infrastructure, such as transport or utilities like electricity and water supply, can have significant detrimental impacts on local and regional economies. The long term closure of businesses, for example, can lead to job losses and other economic impacts.

The vulnerability of buildings is important to understand in terms of their occupants and their type. For example, it is much more difficult to evacuate the old and ill from hospitals and care homes than people working in offices or industrial areas. Building types that need to be operational during- and post-flood, such as ambulance stations and emergency response centres are also vulnerable as if the services they provide are disrupted by flooding it will place the immediate community at greater risk.

[18] Defra and Environment Agency (2006) Flood Risks to People Phase 2

[19] Gibbs, G., Surendran, S., Wade, S. and Udale-Calrke, H. (2008) Supplementary note on flood hazard ratings and thresholds for development planning and control purpose – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1

Transport and strategic utilities infrastructure can be particularly vulnerable to flooding because interruption of their function can have widespread effects well beyond the area of flooding. For example, flooding of primary roads or railways can deny access to areas for the duration of the flooding, as well as causing damage to the road or railway. Flooding of water distribution infrastructure such as pumping stations or of electricity sub-stations can result in loss of water or power over large areas. This can magnify the impact of flooding beyond the immediate community and reinforces why decisions to locate development in floodplain should be taken very carefully.

Placing new development or regenerating in flood risk areas has its additional short and long term costs. The need to build resistant and resilient properties could significantly increase overall costs of development, whilst ongoing maintenance and insurance increase future expenditure.

Flooding Impacts on the Environment

Environmental impacts can be significant and include soil erosion, bank erosion, land sliding and damage to vegetation as well as the impacts on water quality, habitats and flora and fauna caused by bacteria and other pollutants carried by floodwater.

Flooding can have a beneficial role in natural habitats. Many wetland habitats are dependent on annual flooding for their sustainability and can contribute to the storing of flood waters to reduce flood risk elsewhere. It is important to recognise the value of maintenance or restoration of natural riparian zones such as grasslands which protect the soils from erosion and ‘natural’ meadows which can tolerate flood inundation. The use of Green Infrastructure throughout the river corridor can also play a vital role in enhancing the river environment as well as safeguarding land from future development, protecting people and buildings from flooding and reducing flood risk downstream.

A natural floodplain can help accommodate climate change and improve the quality of rivers and associated wetlands to help achieve ‘good status’ by 2015 under the Water Framework Directive. Meeting WFD objectives involves not only ecosystems, water quality, drought and flood impact considerations but also the physical characteristics and morphology of the river channel, floodplain and associated structures.

Appendix B: - Flood Risk Assessment Hierarchy

B.1 FLOOD RISK ASSESSMENT HIERARCHY

B.1.1 Introduction

Flooding is a natural process and does not respect political demarcations or administrative boundaries; it is influenced principally by natural elements of rainfall, tides, geology, topography, rivers and streams and man made interventions such as flood defences, roads, buildings, sewers and other infrastructure. As was seen in the summer 2007 floods, flooding can cause massive disruption to communities, damage to property and possessions and even loss of life.

For this reason it is important to avoid developing in flood risk areas in the first instance. Where this is not possible development should be directed to areas with the lowest possible level of flood risk. Having exhausted all opportunities to direct development away from areas of flood risk then the allocation of land for development must consider the vulnerability of the proposed land use to flooding and take measures to minimise flood risk to people, property and the environment. This is the thrust of the risk based sequential approach to managing flood risk and it is the backbone of PPS25.

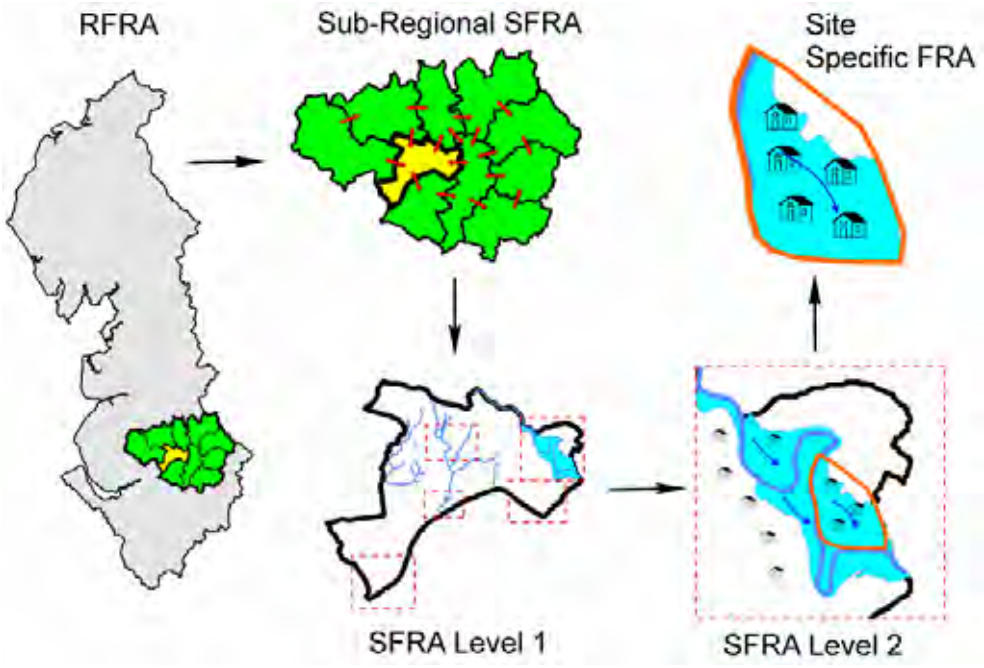
Current Government policy requires local authorities to demonstrate that due regard has been given to the issue of flood risk as part of the planning process. It also requires that flood risk is managed in an effective and sustainable manner and where new development is as an exception necessary in flood risk areas, the policy aim is to make it safe without increasing flood risk elsewhere and wherever possible reduce flood risk overall.

Within the hierarchy of regional, strategic and site-specific flood-risk assessment, a tiered approach ensures that the level of information available is appropriate to the scale and nature of the flood-risk issues and the location and type of development proposed, avoiding expensive studies and the development of mitigation measures where it is not necessary. Figure B1 highlights the hierarchical approach to flood risk assessment.

As stated in PPS25 the three principle levels of assessment comprise:

- **Regional Flood Risk Appraisal (RFRA)** – a broad overview of flood risk issues across a region to influence spatial allocations for growth in housing and employment as well as to identify where flood risk management measures may be required at a regional level to support the proposed growth
- **Strategic Flood Risk Assessment (SFRA)** – an assessment of all types of flood risk informing land use planning decisions. This will enable the LPA to apply the Sequential Test in PPS25 and allocate appropriate sites for development, whilst identifying opportunities for reducing flood risk
- **Site Specific Flood Risk Assessment (FRA)** – site or project specific flood risk assessment to consider all types of flood risk associated with the site and propose appropriate site management and mitigation measures to reduce flood risk to and from the site to an acceptable level

Figure B1: Hierarchical approach to Flood Risk Assessments[20]



Implementation of the sequential risk-based approach requires forward planning. Policy decisions are best made within RSSs and LDF/LDDs, guided by information on flood risk, ensuring that the allocation of land inappropriate for development does not unnecessarily raise expectations of landowners and developers. Policy decisions should be informed through the preparation of RFRAs and SFRAs. These assessments are broad-brush assessments of the risk of flooding, to guide strategic planning decisions. They involve the collection and collation of data on flooding and flood-risk management to provide information at the appropriate level of detail to allow decision-makers to:

- Prepare appropriate policies for flood-risk management within RSSs and LDFs
- Understand the scale, extent and nature of the flood risk at a community level and how that would alter in the event of a proposed development
- Apply a risk-based, sequential approach, to the allocation of land for development and confirm for example the compatibility of the likelihood of flooding and flood risk vulnerability
- Assess whether application of the Exception Test is required and if so whether or not it is likely to be passed
- Inform the preparation of the Strategic Environmental Assessment of RSSs and LDFs
- Translate national guidance into locally specific guidance, including for example the identification of areas of floodplain that should be safeguarded for flood management purposes
- Identify the level of detail required for site-specific flood-risk assessments in particular locations
- Determine the acceptability of flood risk in relation to emergency planning capability and how the existing and proposed community would respond to a flood event

B.1.2 Greater Manchester Sub-Regional SFRA

The Greater Manchester sub-regional SFRA was published in August 2008 on behalf of the Association of Greater Manchester Authorities (AGMA). The main objective of the SFRA was to *"bring together existing information and identify where further, more detailed assessments are required."*

[20] AGMA (2008) Greater Manchester Sub-regional Strategic Flood Risk Assessment

The Greater Manchester sub-regional SFRA was undertaken to provide a baseline and scope from which more detailed District-level assessments can be completed. The principal aims of the SFRA were to:

1. Assess and identify the different levels of flood risk (high, medium or low) and sources of flooding (main river, Critical Ordinary Watercourse (COW), surface water, canal, reservoir etc) across Greater Manchester, at both the sub-regional level (using river catchments) and District level and to map these for statutory land use planning purposes.
2. Undertake District flood risk assessments that will supplement current policy guidelines (i.e. PPS25) and provide a 'risk based' approach to policy making and development control within Greater Manchester. This was intended to provide clarity and inform both local authority officers and developers, ensuring that, where flood risk is identified as a relevant issue that must be addressed as part of the application process, the degree of mitigation required is appropriate to the scale of development and/or risk faced.

The Greater Manchester sub-regional SFRA is an excellent example of a high level document, which introduced the concept of flood risk to all Greater Manchester authorities and the hydrological connectivity that links each council together. By carrying out such a strategic document, it has allowed a partnership and familiarity to be created between the local authorities and key stakeholders in flood risk issues and the need for a greater understanding and single belief in flood risk management.

The Greater Manchester sub-regional SFRA has also benefitted future work such as the Level 1 and Level 2 SFRA for Bury, Rochdale and Oldham. By carrying out the majority of the ground work, it has allowed a Level 2 assessment to be more focused on the areas at greater risk and where greater detail of residual risks is needed. It has also reviewed the majority of flood risk information available from a variety of key stakeholders.

It was also recommended that the Greater Manchester sub-regional SFRA should be kept as a 'living' document and to help facilitate the process, a 'Flood Risk Library' should be created. This should be used as "a single point within AGMA for the collection and cataloguing of flood risk data relevant to the sub-region." This information would include completed FRAs, records of flood events and updated flood risk information and studies for the Environment Agency and other organisations. The Bury, Rochdale and Oldham SFRA should fit into the Flood Risk Library and be used to update the Greater Manchester sub-regional SFRA data gaps if required or simply used as separate source of flood risk information.

All data collected during the Greater Manchester sub-regional SFRA was reviewed on receipt and the level of accuracy and relevance was assessed. A data register was created providing a list of all data collected and the outcome of the review. The purpose of the register was to allow a quick an easy review of data gaps needing review during further work in Level 1 and Level 2 SFRAs.

Appendix C: - The Planning Framework

C.1 THE PLANNING FRAMEWORK

C.1.1 Introduction

The purpose of this section of the report is to identify and outline those high level documents which must be taken into account in preparing this SFRA, from a national to a local level.

The land use planning process is driven by a whole host of policy guidance on a national, regional and local level. Whilst the majority of these policies are not aimed at mitigating flood risk, there are key links at strategic, tactical and operational levels between land use and spatial planning (Regional and Local Government), and Flood Risk Management (FRM) planning (Environment Agency), which should be considered as part of a planned and integrated approach to delivering sustainable development.

The sustainability appraisal will help draw together these links and balance the application of wider social, economic and environmental planning policy and guidance. Flood risk assessment is required at all levels of the planning process and for all major developments in flood risk areas; these play an increasingly important role in assisting effective delivery of key planning objectives.

C.1.2 Flood Risk Management Drivers

The principal FRM policy drivers are brought together in the Government's recently released draft Flood and Water Management Bill and it is an important part of the Government's response to Sir Michael Pitt's Report on the summer 2007 floods. It also gives effect to a number of commitments in the Government's "Future Water" strategy document. In addition, the draft Bill responds to a number of climate change challenges including more frequent extreme weather events causing a greater risk of flooding and drought, increased population, increased water demand and more water quality problems. It provides the Environment Agency with a strategic overview role for all sources of flood risk in England and Wales and gives local authorities in England a clear leadership role in local flood risk management. An improved integrated and risk based approach is proposed for the future management of flood risk and this requires other concerns such as sustainability, biodiversity and the whole water cycle to be taken into account by local authorities and other relevant organisations.

A core policy thread running through all current policy drivers is the fundamental shift in emphasis from building defences to prevent flooding, to one of managing flood risk by using a suite of measures. All operating authorities are required to invest in the provision of sustainable flood risk management and this includes LPAs adopting a flood risk management hierarchy of assessing, avoiding, substituting, controlling and mitigating flood risk through the land use planning system. They should have regard to flooding from all sources (particularly surface water and not just from rivers and the sea). Government does however; recognise that in some circumstances, appropriate mitigation measures may still involve new, or improving and maintaining existing flood defences where justified, to protect increasingly vulnerable communities.

Current key policy related documents provide LPAs with important and valuable knowledge on the strategic direction of flood risk management and assist their strategic land use planning decision making for re-generation, inward investment and growth etc.

Key documents currently influencing FRM policy are:

- EU Floods Directive – EU (2007)
- Draft Floods and Water Management Bill – Defra (2009)
- Future Water – Defra (2008)
- Improving Surface Water Drainage – Defra (2008)
- Making Space for Water – Defra (2005)
- Planning Policy 25: Development and Flood Risk – DCLG (2006)
- Planning Policy 25: Development and Flood Risk Practice Guide – DCLG (2009)
- Learning Lessons from the 2007 Floods – Sir Michael Pitt (2008)
- Catchment Flood Management Plans – currently being implemented

- Shoreline Management Plans – currently being revised

EU Floods Directive

The "EU Floods Directive" aims to reduce and manage the risk floods pose to human health, the environment, cultural heritage and economic activity. Member States have two years in which to transpose its provisions into domestic legislation and the first requirements of the Directive begin at the end of 2011.

England and Wales have recently implemented the Flood Risk Regulations (2009) which came into force on the 10th December 2009, transposing the Directive into law. These regulations outline the requirement for the Environment Agency and Lead Local Flood Authorities to create Preliminary Flood Risk Assessments (PFRAs). PFRAs must be completed by the Environment Agency for flooding from main rivers, the sea, and reservoirs. Lead Local Flood Authorities must complete PFRAs for local flood risk - i.e. other sources apart from rivers, the sea and reservoirs (therefore focusing on ordinary watercourses, surface water and groundwater flooding). The aims of these PFRAs are to identify significant flood risk areas.

For these significant flood risk areas flood hazard and flood risk maps must be created by the Environment Agency or Lead Local Flood Authority (dependent on the source of risk as above). Flood Risk Management Plans (FRMP) will also need to be created for each flood risk area identified. These FRMP must include:

- Objectives for the purpose of managing ; flood risk:
    - With the aim of reducing the adverse consequences of flooding to human health, economic activity and the environment, and
    - Reducing the likelihood of flooding.
- The proposed measures for achieving those objectives

The timetable for which these assessments or plans should be carried out is outlined below:

Assessment or Plan	Organisation to carry out study	Deadline	1st Review
River Basin PFRA	Environment Agency	22nd Dec 2011	22nd Dec 2017
Local Authority PFRA	Lead Local Flood Authorities	22nd Dec 2011	22nd June 2017
River Basin Flood Hazard and Risk Maps	Environment Agency	22nd Dec 2013	22nd Dec 2019
Local Authority Flood Hazard and Risk Maps	Lead Local Flood Authorities	22nd Dec 2013	22nd June 2019
River Basin FRMP	Environment Agency	22nd Dec 2015	22nd Dec 2021
Local Authority FRMP	Lead Local Flood Authorities	22nd Dec 2015	22nd June 2021

It is expected that PFRAs will be required by March 2011. Therefore work on PFRAs by Lead Local Flood Authorities needs to begin in March 2010 at the latest which allows one year for PRFAs to be compiled and submitted to the Environment Agency for review. This will then allow time for review, changes and the consolidation of reports from Local Authorities and the Environment Agency in time for the December deadline.

The Government proposes to use existing flood risk planning outputs of RFRAs and SFRAs to deliver the requirements of PFRAs. It is also proposed that local authorities extend their Level 2 SFRAs to look at the impact of flooding on the environment and cultural heritage when determining SFR areas. In addition, it is proposed that SWMPs will be FRMPs under the Directive, and will also be a tool more generally for local flood risk management. This integrated approach will underpin the planning system and guide the location of future development to avoid and minimise flood risk, whilst also meeting the requirements of the Floods Directive. Local authorities, through their land use planning activities, have a key role to play.

Draft Flood and Water Management Bill

The "Draft Flood and Water Management Bill" proposes new unifying legislation covering all forms of flooding and shifting the emphasis from building defences to managing risk. It aims to:

- Reduce the likelihood and impacts of flooding
- Improve the ability to manage the risk of flooding, by clarifying who is responsible for what
- Reduce pollution and improve water quality
- Give water companies better powers to conserve water during drought
- Reduce red tape and other burdens on water and sewerage companies
- Improve the overall efficiency of the industry

A number of proposals in the draft Bill have particular implications for local authorities, land use planning and related flood risk. These include:

- The Environment Agency will be given a strategic overview role covering all forms of flooding and will coordinate maps and plans in relation to the sea, main rivers and reservoirs; it will also be given the same powers as councils to carry out coastal erosion works and may be a statutory consultee in respect of future coastal erosion planning applications
- Local authorities will have an enhanced leadership role in local flood risk management which includes ensuring that flood risk from all sources, including from surface run-off, groundwater and ordinary watercourses, is identified, taken account of in the spatial planning process and managed as part of locally agreed work programmes
- Local authorities will develop a suite of measures for managing local flood risk, for example, surface water mapping, appropriate development planning and collating information on flood risk and drainage assets
- County and unitary authorities will be responsible for local flood risk assessment as Lead Local Flood Authorities and lead in ensuring the production of SFRAs and SWMPs
- SWMPs will have a stronger role in coordinating development and investment planning
- County and unitary authorities will lead new local partnerships and have responsibility for adopting and maintaining sustainable drainage systems (SUDS) in new development, where they affect more than one property
- The automatic right to connect surface water drains and sewers to the public sewerage system will be ended and developers will be required to put SUDS in place in new developments wherever practicable
- Surface water connection to public sewers will be conditional on meeting new national standards for SUDS, and the approval of a SUDS approving body will be needed, and a certificate issued, before development can begin
- Increased emphasis is needed on enabling flood water to safely flow overland with green infrastructure and safe flow routes being identified as part of flood risk assessments
- County or unitary authorities, the Environment Agency and IDBs will have powers to formally designate natural and man-made features (similar in principle to the Listed Buildings classification), which help to manage flood or coastal risk; they will give formal consent before anyone can change or remove the feature and use enforcement powers where needed
- All relevant authorities will be required to co-operate and share information

The content and implications of the draft Bill provide considerable opportunities for improved and integrated land use planning and flood risk management by local authorities and other key partners. The integration and synergy of strategies and plans at national, regional and local scales, is increasingly important to protect vulnerable communities and deliver sustainable re-generation and growth.

Improving Surface Water Drainage

The “Improving Surface Water Drainage” consultation document was produced in support of the Government’s water strategy and in line with Sir Michael Pitt’s initial conclusions. Many of the proposals identified have been carried forward into the new draft Flood and Water Management Bill. The consultation considers policy measures to improve the way surface water runoff is managed. In particular, it proposes:

1. Using SWMPs as a tool to improve co-ordination between stakeholders involved in drainage and local management of flood risk

2. Increasing uptake of SUDS by clarifying responsibilities for adoption and management
3. Reviewing the ability for premises to connect surface water drainage automatically into the public sewer system

Current roles and responsibilities were considered along with various options for improving the current surface water drainage situation. In particular the document recognises that SFRAs and SWMPs already form part of the PPS25 planning framework and there is an aim to enhance their role and make stronger links between surface water drainage and strategic planning.

Making Space for Water Strategy

The "Making Space for Water Strategy" is a milestone document that confirms the Government's strategic direction for Flood and Coastal Erosion Risk Management (FCERM). Over the 20-year lifetime of the new strategy, Government will implement a more holistic approach to managing flood and coastal erosion risks in England. The approach will involve taking account of all sources of flooding, embedding flood and coastal risk management across a range of Government policies, and reflecting other relevant Government policies in the policies and operations of operating authorities for flood and coastal erosion risk management.

The 2004 consultation document "Making Space for Water" sets out the following vision:

"…we want to make space for water so that we can manage the adverse human and economic consequences of flooding and coastal erosion while achieving environmental and social benefits in line with wider government objectives."

In other words, the aim of the strategy is to balance the three pillars of sustainability, managing flood risk and ensuring that the social and economic benefits which accrue from growth and development are attained. This balanced approach, integrating sustainable development with responsible risk management, has underpinned this SFRA.

Section 7 of the consultation document deals with measures to reduce flood risk through land-use planning, which emphasises the Government's commitment to ensuring that the planning system aims to reduce flood risk wherever possible and, in any event, should not add to it. However, it is acknowledged that 10% of England is already within mapped areas of flood risk and that contained within these areas are some of the Brownfield sites which other areas of Government policy has identified as a priority for future housing provision. The document asserts that over the past five years, 11% of new houses were built in flood-risk areas. The document identifies three sets of measures which may be undertaken to manage flood risk when development is sited in such areas:

- Protection measures to provide, at minimum, the standards of protection specified in PPS25
- Provision of features such as sacrificial areas and compartmentalisation to reduce the consequences of a flood event should one occur (such as functional floodplain)
- Use of construction techniques that increase the flood resistance and resilience of buildings

The document proposes that RSSs and LDFs should take full account of flood risk and incorporate the sequential approach in PPS25. Moreover, the document encourages integration with other planning systems, in particular Catchment Flood Management Plans. Use of European Union (EU) funding streams, such as Interreg IIIB is recommended where applicable, to enable Local Authorities to undertake projects aimed at advancing knowledge and good practice in flood risk management.

Making Space for Water: Programme of Work

The "Making Space for Water: Programme of Work" was developed following consultation and takes account of any relevant recommendations that emerged from the Pitt Review into the 2007 floods that affected many parts of England**.**

One of Defra's and CLG's early outputs from the Making Space for Water Programme was the publication of PPS25 in December 2006. This work, together with the Practice Guide forms the Governments required approach to managing and reducing flood risk through the land use planning system.

A valuable piece of work looking at "Developing a Broader Portfolio of Options to Deliver Flooding and Coastal Solutions" has been carried out as part of this programme and is very useful to local authorities and other operating authorities, in their strategic planning of flood risk management. Outputs from this work are available from Defra.

Quarterly update reports are released providing details of progress made and key achievements. These reports can be access via the Making Space for Water website at

http://www.defra.gov.uk/environ/fcd/policy/strategy.htm

The Pitt Review

The "Pitt Review" was carried out following the severe floods of summer 2007 and is a key document for local authorities in their consideration of flood risk management. Sir Michael Pitt was asked by Ministers to conduct an independent review of events and report on the lessons that should be learned. The Review collected evidence by visiting affected areas and examining over 600 written statements submitted by victims of the floods.

The final report was released in June 2008 and contains detailed findings, conclusions and 92 recommendations for action, covering all aspects of strategic and local flood risk management. These interim conclusions are intended to shape the National approach to flood management and can be accessed via the Defra website. Some of the recommendations which are relevant to this SFRA include;

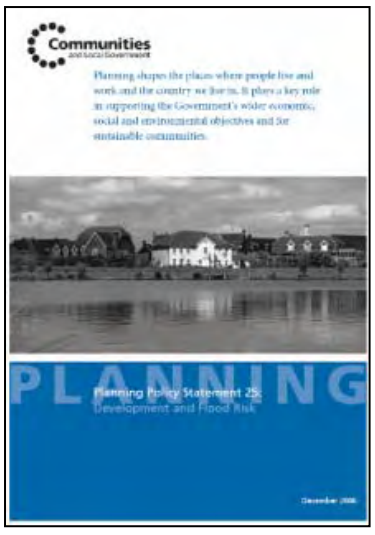
- **Recommendation 11** – Building Regulations should be revised to ensure that all new or refurbished development in high flood risk areas are flood resistant or resilient
- **Recommendation 14** – Local Authorities should lead on the management of local flood risk, with support of the relevant organisations
- **Recommendation 17** – All relevant organisations should have a duty to share information and cooperate with local authorities and the Environment Agency to facilitate the management of flood risk
- **Recommendation 18** – Local Surface Water Management Plans, as set out under PPS25 and coordinated by local authorities, should provide the basis for managing all local flood risk
- **Recommendation 52** – In the short term, the Government and infrastructure operators should work together to build a level of resilience in critical infrastructure assets that ensures continuity during worst case flood event
- **Recommendation 57 –** The Government should provide Local Resilience Forums with the inundation maps for both large and small reservoirs to enable them to assess risks and plan for contingency, warning and evacuation

Pitt's findings, conclusions and recommendations for action are challenging but will be extremely important in guiding local authorities and other operating authorities in their consideration of future flood risk management activities, including land use planning. They have also been a key driver in shaping the content of the draft Flood and Water Management Bill.

C.1.3 National Planning Policy

This SFRA has been prepared in a period during which planning authorities have been implementing the provisions of the Planning and Compulsory Purchase Act 2004 and accompanying planning guidance, including PPS1 Delivering Sustainable Development and PPS12 Local Development Frameworks. This affected all tiers of the planning system and has necessitated major changes at both the regional and local level which will impact on the way in which planned development is approached in the regional strategy and delivered locally.

PPS25 Development and Flood Risk



In December 2006 the Government published PPS25: Development and Flood Risk.

The aim of PPS25 is to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at highest risk. The key planning objectives are that *"Regional Planning Bodies (RPBs) and Local Planning Authorities (LPAs) should prepare and implement planning strategies that help to deliver sustainable development by:*

- Identifying land at risk and the degree of risk of flooding from river, sea and other sources in their areas;
- Preparing Regional or Strategic Flood Risk Assessments (RFRAs / SFRAs) as appropriate, as a freestanding assessment that contributes to the Sustainability Appraisal of their plans;

- Framing policies for the location of development which avoid flood risk to people and property where possible, and manage any residual risk, taking account of the impacts of climate change;
- Only permitting development in areas of flood risk when there are no suitable alternative sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding;
- Safeguarding land from development that is required for current and future flood management e.g. conveyance and storage of flood water, and flood defences;
- Reducing flood risk to and from new development through location, layout and design, incorporating sustainable drainage systems (SUDS);
- Using opportunities offered by new development to reduce the cause and impacts of flooding e.g. SWMPs; making the most of the benefits of green infrastructure for flood storage, conveyance and SUDS; re-creating functional floodplain; and setting back defences;
- Working effectively with the Environment Agency, other operating authorities and other stakeholders to ensure that best use is made of their expertise and information so that plans are effective and decisions on planning applications can be delivered expeditiously; and
- Ensuring spatial planning supports flood risk management policies and plans, River Basin Management Plans and emergency planning."

In addition to setting out the roles and responsibilities for LPAs and RPBs, PPS25 identifies that landowners also have a primary responsibility for safeguarding their land and other property against natural hazards such as flooding. Those promoting sites for development are also responsible for:

- Demonstrating that development is consistent with PPS25 and Local Development Documents (LDDs)
- Providing a Flood Risk Assessment (FRA) demonstrating whether the proposed development: is likely to be affected by current or future flooding; satisfies the LPA that the development is safe; and identifies management and mitigation measures

PPS25 also introduces an amendment to Article 10 of The Town and Country Planning (General Development Order) 1995 which makes the Environment Agency a Statutory Consultee on all applications for development in flood risk areas and those within 20m of a Main River.

The Direction also introduces the requirement for LPAs to notify the Secretary of State where they are minded to approve a planning application contrary to a sustained objection by the Environment Agency.

The introduction of PPS25 enables local authorities to make a direction under Article 4 of the Town and County Planning (General Permitted Development) Order 1995. This will enable Local Authorities to remove permitted development rights where those rights threaten to have a direct, significant and adverse effect on a flood risk area, or its flood defences and their access, or the permeability and management of surface water, or flood risk to occupants.

Proposed Updates to PPS25

On 11 August 2009, CLG published a Consultation Paper on proposed amendments to PPS25. The consultation relates to proposed clarifications to some aspects of the existing national spatial planning policy on development and flood risk, to help ensure the policy is applied effectively. The consultation process is due to end in November 2009.

The proposed amendments affect tables D.1 (Flood Zones) and D.2 (Flood Risk Vulnerability Classification) in Annex D of PPS25.

It is proposed that the definition of the functional floodplain is updated to:

"..The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain"

The reasoning behind this was that by simply stating it should be based on probability rather than local circumstance, leads to areas of land that are not intended to allow for floodwater to flow or be stored being inappropriately identified as functional floodplain, and potentially also for areas that are designed to flood being wrongly excluded from identified functional floodplain.

There are four amendments proposed in Table D.2 including:

1. Moving water treatment and sewage treatment works from 'less vulnerable' to 'essential infrastructure'. This means they will now need to pass the Exception Test if planned in Flood Zone 3a rather than just Flood Zone 3b. As usual, they will have to be designed to the appropriate uses and policy aims within Table D.1
2. Allowing police, ambulance and fire stations to be defined as 'less vulnerable' only if they are **not** required to be operational during flooding. This will stop the exclusion of new emergency services facilities from communities they service in high flood risk areas
3. To allow facilities requiring hazardous substances consent, which are required to be located in flood risk areas, due to their need to be co-located with other facilities (i.e. the need to be located near ports, or processed or manufactured facilities) to be defined as 'essential infrastructure' rather than 'highly vulnerable'
4. Adding wind turbines to the 'essential infrastructure' category. However, in keeping with PPS25, the Sequential Test is not required but Parts A) and C) of the Exception Test would need to be passed if located in Flood Zone 3a and 3b.

Until the proposed changes have been agreed and PPS25 updated, the current PPS25 (2006) and its Practice Guide (2008) should be used for planning policy guidance, but users should be aware of possible future changes.

PPS25 Development and Flood Risk Practice Guide

The Practice Guide to PPS25 was initially published by the Department for Communities and Local Government (CLG) in June 2008. It provides advice on the practical implementation of PPS25 policy and reflects extensive discussion with local authorities, the Environment Agency and other key stakeholders and practitioners. The guide provides further guidance on the preparation of SFRA's and FRAs, the Sequential and Exception Test and outlines potential mitigation measures e.g. SUDS and risk management techniques.

Local Authority planners and developers are advised to refer to and use PPS25 and the practice guide in conjunction with the further advice contained within this report.

December 2009 PPS25 Practice Guide Update

In December 2009, CLG published an update to the PPS25 Practice Guide which replaces the version published in June 2008. It reflects the intention announced at the time of publication to keep the guide fresh and relevant through periodic updates.

The majority of the updates are relatively minor acknowledging material such as the Pitt Review and new flood risk information such as the Environment Agency national Areas Susceptible to Surface Water Flooding map.

Page v of the Practice Guide draws out some of the more substantial changes from the June 2008 version of the guide. Some of the key ones relevant to this SFRA are highlighted below.

- "Additional advice on applying the sequential approach at the regional level over a longer time frame"
- " Further advice on the issues relating to guidance provided within SFRAs, including on the role of surface water management plans"
- "Updated guidance on climate change impacts"
- "Updated guidance on applying the sequential approach to other sources of flooding"
- "Further advice on the application of the Sequential Test, including on the availability of alternative sites"
- "Further clarification on defining functional floodplains21"

As mentioned above consultation on proposed amendments to PPS25 are expected in an updated PPS25 in spring 2010 and will be reflected in further iterations of the Practice Guide

[21] Communities and Local Government (2009) PPS25: Practice Guide

Other Planning Policy Statements

PPS1 *Delivering Sustainable Development* published in February 2005 by the Office of the Deputy Prime Minister sets out the overarching planning policies for the delivery of sustainable development across the planning system and sets the tone for other planning policy statements. PPS1 explicitly states that development plan policies should take account of flooding, including flood risk. It proposes that new development in areas at risk from flooding should be avoided. Planning authorities are also advised to ensure that developments are *"sustainable, durable and adaptable"* including taking into account natural hazards such as flooding.

PPS1 also places an emphasis on 'spatial planning' in contrast to the more rigid 'land use planning' approach which it supersedes. Planning authorities will still produce site specific allocations and a proposals map as LDDs, but their Core Strategy will be more strategic and visionary in content and will take into account the desirability of achieving integrated and mixed use development and will consider a broader range of community needs than in the past. With regard to flood risk, it will be important for the Core Strategies and accompanying Supplementary Planning Documents to recognise the contribution that non-structural measures can make to flood management.

Planning Policy Statement: Planning and Climate Change, a supplement to PPS1, published in December 2007, sets out how the Government expects the planning system to address climate change. It explains that there is a compelling scientific consensus that human activity is changing the world's climate. The evidence that climate change is happening, and that man-made emissions are its main cause, is strong. The Intergovernmental Panel on Climate Change highlights that we are already experiencing the effects of climate change and if these changes deepen and intensify, as they are predicted to do without the right responses locally and globally, we will see even more extreme impacts.

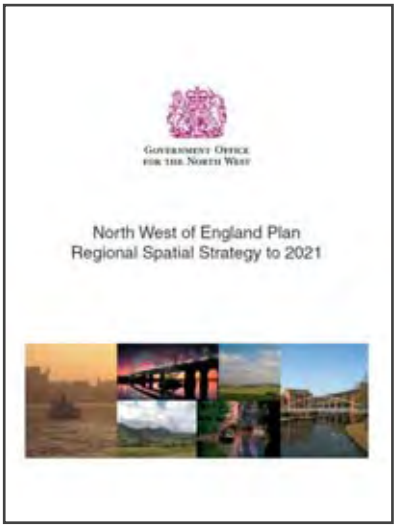
One of the predicted impacts of climate change is more intense periods of rainfall and consequent flooding. The PPS1 supplement requires Regional Spatial Strategies and Local Development Frameworks to shape sustainable communities that are resilient to such effects. A key objective of the planning system is securing new development and shaping places that minimise vulnerability and provide resilience to climate change in ways that are consistent with social cohesion and inclusion. Accordingly new development should be planned to minimise future vulnerability in a changing climate. The SFRA incorporates Sequential and Exception Test information that is essential in meeting the objectives of the PPS1 supplement Planning and Climate Change.

Whilst not directly relevant to the development of an SFRA, it is important to recognise that the exercise takes place within the context of other planning policy guidance and statements, some of which also require sequential testing of site allocations and development proposals. PPS3 (Housing), emerging PPS4 (Planning for Sustainable Economic Development) and PPS6 (Planning for Town Centres) are intrinsic within the planning process and, therefore, an understanding of the constraints faced as a result of this additional policy guidance is required.

C.1.4 Regional Policy Drivers

Regional Spatial Strategy

The Regional Planning Guidance for the North West (RPG13) was published in March 2003. In September 2004, following the implementation of the Planning and Compulsory Purchase Act 2004, the Regional Planning Guidance was converted to the Regional Spatial Strategy (RSS) in line with Governmental reforms.



Regional Planning Bodies have the main responsibility for preparing Regional Spatial Strategies (RSS). In the North West this is the North West Regional Assembly (NWRA). NWRA launched a Full Review in July 2004 and, following informal consultations at issues, options, and Interim Draft stages, submitted the Draft RSS to the Secretary of State on 30th January 2006. The Draft Submitted RSS for North West England (also known as 'The North West Plan') was published for public consultation on 20 March 2006.

The final RSS was published in September 2008 and now outlines the current adopted planning strategy for the period to 2021.

The RSS sets out housing targets for each local authority under policy L4, which are shown in Table C1. The housing provision targets take account of RSS and Regional Housing Strategy objectives, regional development framework and sub regional policies within the RSS and various strategic priorities and functional linkages.

Both Rochdale and Oldham are classified as Pennine Manchester, where there is support for potential economic growth and regeneration, particularly in Housing Market Renewal Pathfinder areas; including replacing and renewing existing housing and, where appropriate, developing a wider range of housing types. Bury is classified as Northern Manchester, where there is support for potential economic growth and local regeneration and developing a wider range of housing types

Table C1: Housing targets

Local Authority	Housing target to 2021	Annual housing provision	Target for development on previously developed land
Rochdale	7,200	400	80%
Bury	9,000	500	80%
Oldham	5,200	289	80%

AGMA has been identified as a national growth point, which will enable the delivery of additional housing up to 2017. This will initially focus on Manchester, Salford, Trafford and Bolton, but may also increase housing targets in Bury, Rochdale and Oldham.

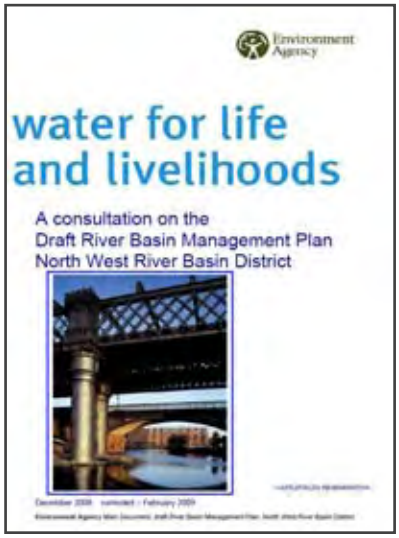
The published RSS, when compared to the previous, demonstrates an increased emphasis and heightened awareness of flood risk. Under the emerging RSS Policy EM 5, 'Integrated Water Management' states:

"In achieving integrated water management and delivery of the EU Water Framework Directive, plans and strategies should have regard to River Basin Management Plans, Water Company Asset Management Plans, Catchment Flood Management Plans, and the Regional Flood Risk Appraisal. Local planning authorities and developers should protect the quantity and quality of surface, ground and coastal waters, and manage flood risk, by:

- *Working with the Water Companies and the Environment Agency when planning the location and phasing of development. Development should be located where there is spare capacity in the existing water supply and waste water treatment, sewer and strategic surface water mains capacity, insofar as this would be consistent with other planning objectives. Where this is not possible development must be phased so that new infrastructure capacity can be provided without environmental harm;*
- *Producing sub-regional or district level strategic flood risk assessments, guided by the Regional Flood Risk Appraisal. Allocations of land for development should comply with the sequential test in PPS25. Departures from this should only be proposed in exceptional cases where suitable land at lower risk of flooding is not available and the benefits of development outweigh the risks from flooding;*
- *Designing appropriate mitigation measures into the scheme, for any development which, exceptionally, must take place in current or future flood risk areas, to ensure it is protected to appropriate standards, provides suitable emergency access under flood conditions, and does not increase the risk of flooding elsewhere;*
- *Requiring new development, including residential, commercial and transport development, to incorporate sustainable drainage systems and water conservation and efficiency measures to the highest contemporary standard;*
- *Encouraging retrofitting of sustainable drainage systems and water efficiency within existing developments;*
- *Raising people's awareness of flood risks (particularly for vulnerable groups) and the impacts of their behaviours and lifestyles on water consumption.*[22]"

[22] Communities and Local Governments (2008) The North West England Plan Regional Spatial Strategy to 2021

North West River Basin Management Plan



In accordance with the Water Framework Directive (WFD), implemented in December 2000, a River Basin Management Plan (RBMP) must be produced for each of the 11 River Basin Districts by 2009. The Environment Agency state that:

"RBMPs will have a number of functions, but are primarily intended:

- *To establish a strategic plan for the long term management of the River Basin District.*
- *To set out objectives for waterbodies and in broad terms what measures are planned to meet these objectives*
- *Act as the main reporting mechanism to the European Commission"*

A draft RBMP for the North West was prepared in December 2008 and it was out for consultation until June 2009.

According to the draft plan it *"focuses on achieving the protection, improvement and sustainable use of the water environment - surface freshwaters (including lakes, streams and rivers), groundwater, and ecosystems such as some wetlands that depend on groundwater, estuaries and coastal waters out to one nautical mile."*

The main actions proposed in Annex C relevant to this SFRA include:

- *"A commitment to deliver Catchment Flood Management Plans (CFMPs) to identify and agree policies for sustainable flood risk management for the next 100 years. By employing sympathetic flood risk management, such as that done at Long Preston Deeps in the Ribble catchment, opportunities to enhance sites either designated for their conservation status or to help restore more natural flows to river systems can be created.*
- *Working closely with partners to deliver Shoreline Management Plans (SMPs) to manage the current and future flood risk to the North West coast lines.*
- *Our inputs to the Regional Spatial Strategy and the Local Development Framework will ensure that Water Cycle strategies are incorporated in major planning initiatives. We shall continue to influence planners and developers to incorporate sustainable water use in construction/maintenance projects and also follow the Code for Sustainable Homes.*
- *More use of sustainable drainage systems in new developments.*
- *Regional Spatial Strategy and Local Development Frameworks should include policies that address the potential impacts of proposed levels of development to water resources, water quality, biodiversity, river restoration, green infrastructure, contaminated land and managing surface water and flood risk.*[23]*"*

Climate Change Action Plan for the North West

In 2006, the North West Development Agency (NWDA) launched the regions Climate Change Action Plan "Rising to the challenge: A Climate Change Action Plan for England's North West".

The Action Plan sets out the North West's vision and outlines the associated outcomes to be achieved by 2020. In order to achieve these outcomes, the plan recognises that it must focus on twin objectives of reducing regional greenhouse gas emissions and more importantly to this SFRA, adapting to those effects of climate change that are now unavoidable. One of the unavoidable effects of climate change is its impact on flood risk.

[23] Environment Agency (2008) A Consultation on the Draft River Basin Management Plan North West River Basin District

Flood risk related climate change issues are extremely important to the future management of flood risk in the UK and beyond. These issues need to be taken seriously and mitigation and adaptation measures planned and adopted by Regional and Local Authorities.

Principle adverse flood risk effects of climate change threatening people and property include:

- More frequent and intense rainfall events causing flash flooding to low lying areas
- More and faster surface water runoff and overland flows causing sewers, drains, rivers and streams to overflow
- Increased sea level rise, storminess and frequency of storm surges threatening low lying coastal communities
- Rising groundwater levels causing increased spring source activity and higher spring flows, increasing the risk of flooding

If not addressed, these effects are likely to have a significant impact on many communities and in particular new developments in areas at high risk of flooding. Recent climate change trends are contained within a UK Climate Impacts Programme document: "The Climate of the United Kingdom and Recent Trends", which was published in December 2007. The next UKCP09 report, that includes revised climate change predictions was launched in late 2009.

In recognition of the Governments' increasing concerns about the effects of climate change on flood risk management, Defra produced a "Supplementary Note to Operating Authorities – Climate Change Impacts" in October 2006 in which they updated the climate change policy for flood and coastal management. This document is available on the Defra website. In conjunction with Defra, DCLG then provided the recommended climate change contingency allowances for sea level rise and precautionary sensitivity ranges for peak rainfall intensities and peak river flows etc. in Annex B of PPS25. These figures should be used in all aspects of flood risk management including the consideration of new developments and changes of land use in flood risk areas.

RFRA – 4 North West

The North West Regional Flood Risk Appraisal was prepared in October 2008 for 4NW, which is the Regional Planning Body in the North West.

The primary objective of a Regional Flood Risk Appraisal (RFRA) is to provide an appraisal of strategically significant flood risk issues in a region in order to guide strategic planning decisions.

The RFRA assists decisions on key land use factors such as the need for employment, inward investment, regeneration, provision of housing and open/green space, major road and other infrastructure development provision to deliver sustainable growth whilst taking full account of flood risks, now and in the future. The appraisal should also drive and inform policy development and setting in the Regional Spatial Strategy (RSS) for the strategic management of flood risk, and in turn assists local authority planners in their consideration and implementation of land use policies in Local Development Frameworks (LDFs) and Local Development Documents (LDDs). In addition, it provides important strategic flood risk input to the Regional Sustainability Appraisal (RSustainability Appraisal) and the Strategic Environmental Assessment (SEA).

The timing of the revised guidance in PPS25 prevented the consideration of a RFRA within the sustainability appraisal for the draft and subsequent RSS. It is envisaged that the information in the RFRA, alongside knowledge from SFRAs and Catchment Flood Management Plans will provide a useful input to future rounds of the sustainability appraisal for the RSS.

The outputs of the RFRA help to identify where there may be a need for further flood risk assessment work to be undertaken, particularly in respect of Strategic Flood Risk Assessments (SFRAs) and where strategically significant developments are proposed in areas currently at risk of flooding. Even where SFRAs already exist, the RFRA helps to place specific local authority flood risks into a regional context, showing the variation of risk and the interdependency between neighbouring authorities and river sub-catchments. Flooding does not respect local authority administrative boundaries and the RFRA provides a mechanism to help local authorities work better together, and with key stakeholders, to consider, communicate and share common or similar flood risk management policy objectives, opportunities and constraints.

The RFRA assessed significant flood risk by:

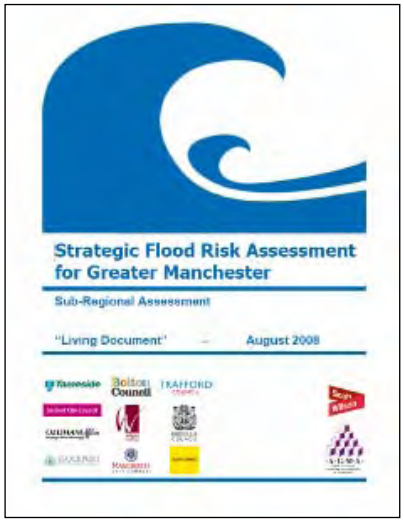
- Undertaking a survey of local authorities to gauge their broad assessment of flood risk issues
- Reporting on the work undertaken by the Environment Agency to evaluate the potential

impact of fluvial and coastal flooding in relation to the proposed housing figures set out in the draft RSS

- Assessing any potential flood risk implications related to regionally significant economic development
- Considering other sources of flooding, such as sewers and groundwater
- Considering the potential impacts of climate change

In a ranking of fluvial and tidal flood risk, that takes into account flood risk and development pressures, out of a maximum of 15 points, Rochdale scores 6 and Bury and Oldham both score 4. A lower position indicates that development could take place outside of the highest risk areas, but a SFRA is required for all local authorities, regardless of ranking, to further define the risks from all sources of flooding.

AGMA SFRA



The Greater Manchester sub-regional SFRA was published in August 2008 on behalf of the Association of Greater Manchester Authorities (AGMA). The main objective of the SFRA was to *"bring together existing information and identify where further, more detailed assessments are required."*

The SFRA looks into flood risk issues across the AGMA area and considers linkages in the river systems between different local authority boundaries. It provides recommendations for further work in local authority SFRAs, including filling in data gaps, such as surface water flooding.

Local Planning Policy

Following the introduction of the Planning and Compulsory Purchase Act 2004, the way in which development plans are prepared is changing. With the aim of speeding up and simplifying plan preparation and improving community involvement, development plans in their current form are to be abolished and replaced with a new development plan system, the Local Development Framework (LDF).

The Emerging Local Development Framework

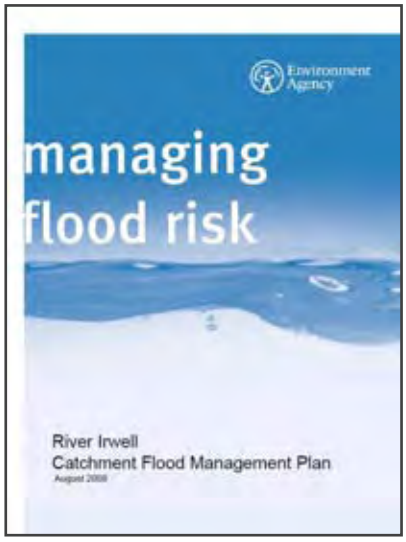
The UDP is currently in the process of being replaced by the Local Development Framework (LDF). The LDF will take the form of a portfolio of plans and documents made up of several Local Development Documents (LDDs). Some of them will have statutory status (Development Plan Documents (DPDs)) and others will be adopted as local guidance documents. LDDs can either deal with different issues or different geographical areas, but when taken together they will set out the Council's policies for how it will assess development proposals and direct future growth.

The LDF includes a Statement of Community Involvement (SCI) that describes how the local planning authority intends to carry out its public consultation arrangements. Bury, Rochdale and Oldham Councils are currently preparing their LDFs, which will be subject to public examination by an independent Planning Inspector who will assess the soundness of the LDF documents. This will include assessing that the LDF is based on robust and credible evidence.

PPS25 requires a SFRA to be carried out in order to inform policy development and to apply the Sequential Test and Exception Test, where necessary, when allocating sites for development. The relevant LPA should be contacted regarding the stage of the LDF in its preparation.

C.1.5 Environment Agency Policy

Catchment Flood Management Plans



Bury, Rochdale and Oldham Councils are covered by two CFMPs; The River Irwell CFMP and the Upper Mersey CFMP. The Irwell and Upper Mersey CFMPs are high level policy documents covering the whole of the River Irwell and Upper Mersey catchments. The Irwell CFMP is the only one relating to the Level 1 SFRA study area of Bury, Rochdale and the Beal catchment.

The CFMP is investigating what factors influence flood risk at the catchment scale and will assess the impacts that climate change, land use change and urbanisation may have on flood risk over the next 50 to 100 years.

The CFMP will establish a policy framework for flood risk management across the catchment through which future flood defence management strategies and programmes will be formulated. Recognition of these strategic plans is very important to local authority planners when planning for the future and considering long term land use options for re-generation, inward investment and growth.

The CFMPs help to prioritise activities, focus resources where there is greatest need and determine what flood risk management responses need to be considered further (and which responses will not be effective). The responses to flood risk will be broader than those traditionally used for flood defence to reflect the full range of management options available. CFMPs support an integrated approach to spatial planning and river basin management, in line with the Water Framework Directive and the EU Directive on the assessment and management of flood risk; they cover all geographical areas in England and Wales and are crucial in the planning of sustainable flood risk management.

CFMP Policy Units covering Bury, Rochdale and Oldham are identified in the Figure C1 below. Each colour in the key represents the chosen policy.

There are a number of chosen sustainable flood risk management policies relating the areas within Bury, Rochdale and Oldham. These include CFMP Policies:

- Policy 3: Continue with existing or alternative actions to manage flood risk at the current level (accepting flood risk will increase from this baseline)
- Policy 4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change)
- Policy 5: Take further action to reduce flood risk
- Policy 6: Take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits, locally or elsewhere in the catchment

Table C2 below outlines Policy Units covering Bury, Rochdale and Oldham, generic risk and policy chosen for the area.

Figure C1: Bury, Rochdale and Oldham CFMP policy units

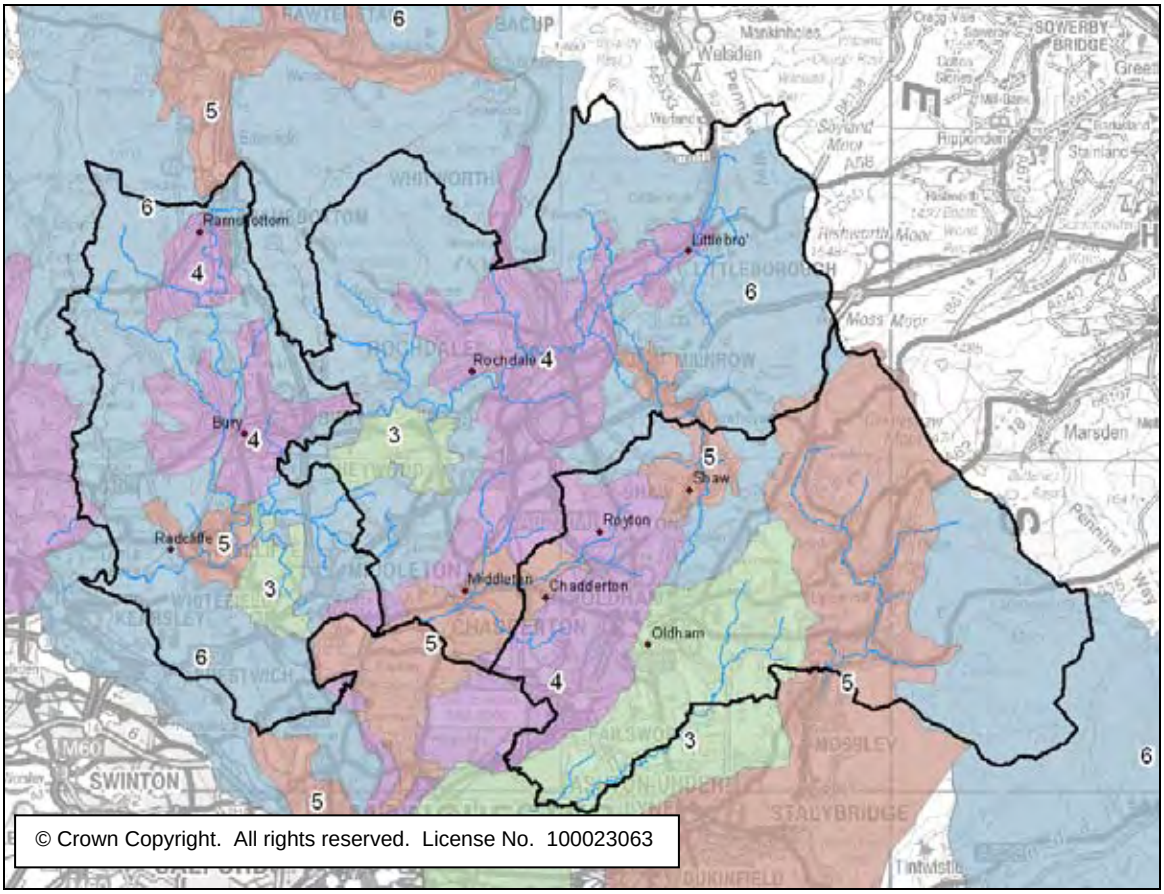


Table C2: River Irwell CFMP policies covering Bury, Rochdale and Oldham

Policy Unit	Notes	Policy
Radcliffe	The standard of protection is currently below target. Climate change and urban growth may increase flood risk. Economic damages are high.	5
Bury	Current level of risk is thought to be low. Significant urban development potentially at risk if flood risk management activity is reduced.	4
Ramsbottom	Recently completed flood defence scheme provides 1% standard of protection and this level is through to be appropriate. High economic damages if flooding occurs.	4
Rural Rossendale	Current level of flood risk is thought to be low. Attenuation here could reduce flood risk downstream.	6
Whitefield	Flood risk is thought to be above the indicative standards. Levels of flood risk do not increase significantly under the modelled future changes to the catchment. Flood risk management activities are still required to maintain culvert capacities.	3
Rochdale, Whitworth and Littleborough	Recent flood defence scheme provides 1 in 100 year standard of protection and this level is thought to be appropriate. High economic damages if flooding occurs.	4
Milnrow and Shaw	Current levels of risk are thought to be high. Economic appraisal suggests potential benefits from flood risk management works.	5
Rural Roch	Current level of risk in rural areas is low. Attenuation of flood waters could reduce flood risk downstream in Whitworth, Milnrow and Shaw.	6
Heywood	Flood risk is thought to be above the indicative standards. Levels of flood risk do not increase significantly under the modelled future	3

Policy Unit	Notes	Policy
	changes to the catchment. Flood risk management activities are required to maintain culvert capacities.	

C.1.6 Summary

In accommodating future development in Bury, Rochdale and Oldham, there is a range of planning policies to consider and balance on a national, regional and local level. Future development needs have been broadly specified in regional plans and are being refined on a local level in the emerging LDF.

PPS25 and its Practice Guide provides the overarching national guidance with respect to development and flood risk, emphasising the need to effectively manage flood risk within the planning system, rather than relying on reactive solutions to flooding. This includes a responsibility for LPAs to reduce flood risk to people and property as a result of new development. It also identifies the preparation of SFRAs as a key process in the understanding and management of flood risk for planning purposes.

It is widely recognised that flood risk is one of a whole raft of policy constraints placed upon the local planning system. Development must facilitate the socio-economic needs of a community, and spatially must sit within an existing framework of landscape and infrastructure. For this reason, a balance must be sought between development need and the risk it may pose upon existing and future dwellers of the area as a result of flooding.

The aim of this SFRA is to provide a better understanding of flood risk in Bury, Rochdale and Oldham that can feed into the emerging LDF along side the Greater Manchester Sub-Regional SFRA and North West RFRA and enable informed and balanced planning decisions to be made.

Appendix D: - Stakeholder Engagement and Data Management

D.1 STAKEHOLDER ENGAGEMENT AND DATA MANAGEMENT

D.1.1 Introduction

The majority of data provided in both the BRO SFRA Volume II and III has been obtained through consultation with those stakeholders with specific interest in or knowledge of sources of flooding within the study area.

PPS25 outlines a number of key consultees to the planning process. Stakeholders and their involvement within the preparation of the BRO SFRA are discussed in Table D1.

Table D1: Stakeholder involvement

Stakeholder	Involvement
LPA	Bury, Rochdale and Oldham Councils were the main stakeholder for the preparation of this SFRA. They focused the scope of the SFRA and provided the detail needed for its production. An initial SFRA meeting was held to discuss the requirements of PPS25 in producing a Level 1 SFRA and to determine the main tasks that needed to be completed. The meeting also outlined the councils' own timetable relating to preparing an evidence base for their LDF process. There have been regular progress meetings outlining progress to date and further data requests. A member of the Environment Agency has always been present to inform the decision making process.
Environment Agency	The Environment Agency is a statutory consultee for RSSs, LDDs, Sustainability Appraisals and Strategic Environmental Assessments. They are also a statutory consultee for planning applications. With regards to the BRO SFRA, the Environment Agency has discretionary powers under the Water Resources Act (1991) to manage flood risk and, as a result, hold the majority of flood risk data in the UK. Separate departments were consulted via the External Relations Team including Development Management, Flood Risk Mapping and Data Management and Reservoir Safety Teams on the SFRA approach and available data. The Environment Agency was also one of the main consultees throughout the preparation of the SFRA and their comments and guidance have been included within report revisions.
United Utilities	The main source of information requested from United Utilities was a copy of their DG5 records. After further discussions with the main SFRA project team and the Environment Agency, further information such as the location of drainage areas and sewers at capacity was also requested. A representative from United Utilities stated that this information would not be available for the SFRA, due to the possibility of misinterpretation of data and it would be more effective if the SFRA used United Utilities modelled outputs. However, United Utilities were also unwilling to share this data. United Utilities Drainage Areas and sewer records were not made available for this SFRA. Bury, Rochdale and Oldham Councils should continue to liaise with United Utilities in conjunction with the Environment Agency and the wider Greater Manchester Authorities to explore how they can contribute to the understanding of flood risk now or in the future. United Utilities have recently made additional data available for SFRAs. Flood risk data was not available in time for the Level 1 and Level 2 SFRAs.
British Waterways	Flood risk from British Waterways Canals was highlighted in the Greater Manchester sub-regional SFRA as a major source of residual risk in Bury, Rochdale and Oldham as flooding has been known to occur, but information on the risk is relatively unknown.

Stakeholder	Involvement
	An initial meeting was held between British Waterways and a Chartered Engineer from JBA to discuss the risk associated with canals. British Waterways supplied very helpful information including historical flood locations, the location of critical embankments and overflow structures. This information shaped the methodology of assessing flood risk from canals discussed in the BRO Level 1 and Level 2 SFRA.

D.1.2 SFRA Data Management

The BRO SFRA should be viewed as a 'living' document for use in the day-to-day process of planning and development. It is therefore important that datasets collected for the SFRA are transparent and accessible. A Data Register has been produced and supplied to the individual Councils listing all data received throughout the SFRA process.

All data was reviewed on receipt and its quality and confidence rated for use in the SFRA. This process was purely based on professional judgement and rated on a high to low scale.

Most data requested was of the quality and accuracy expected. Whilst the majority of the datasets could be mapped geographically using Geographic Information Systems (GIS), helping to visualise the risk of flooding, others were not, reducing the quality score. Historical flooding information was generally marked as both medium quality and confidence, as whilst it could be placed on a map, there was generally information on the source of flooding. The confidence in its precision was also questionable, as expected for historical flood records.

The Data Register will allow intended users of the SFRA to review the accuracy, currency and relevance of all datasets used and for a central group to manage and update datasets when needed. The Data Register also provides details of contacts who supplied the data. The organisations listed should be the first contact for any update to the SFRA to make sure the most up-to-date datasets are used.

Supplying SFRA Data

Whilst all data collected and produced during the BRO SFRA process has been supplied to each LPA (report, maps, GIS, modelled output) there should be controls on its use. It is anticipated that the SFRA report (all volumes) and associated maps will be published on each Council website as PDFs as the central source of SFRA data and available to download.

Each LPA will be able to use the modelled output (depths, hazards and outlines) for internal use. The use of this information must consider the context within which it was produced. The use of this data will fall under the license agreement between the LPA and the Environment Agency as it has been produced using Environment Agency data. It should be remembered that the modelling undertaken for the SFRA is of a strategic nature and more detailed FRAs should seek to refine the understanding of flood risk from all sources to any particular site.

SFRA data should **not** be passed on to third parties outside of the LPA. Any third party wishing to use existing Environment Agency flood risk datasets should contact External Relations in the Environment Agency North West Region. A charge is likely to apply for the use of this data.

Appendix E: - Flood Risk Zones

E.1 FLOOD RISK ZONES

Please note that proposed changes have been made to this table (Table D.1), mainly the definition of the functional floodplain, in the upcoming revision of PPS25. This is expected around spring 2010. See Section C.1.3 for further information.

Zone 1: Low Probability

Definition

This zone comprises land assessed as having a less than 1 in 1000 annual probability of river and sea flooding in any year (<0.1%).

Appropriate uses

All uses of land are appropriate in this zone

FRA requirements

For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in an FRA [Flood Risk Assessment]. This need only be brief unless the factors above or other local considerations require particular attention. See Annex E (of PPS25) for minimum requirements

Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and the appropriate application of sustainable drainage techniques.

Zone 2: Medium Probability

Definition

This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) and between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.

Appropriate uses

The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure listed in… [The Flood Risk Vulnerability Classification, see Table A-2] are appropriate in this zone.

Subject to the Sequential Test being applied, the highly vulnerable uses in Table D.2 (of PPS25 and Table B-2 of this report) are only appropriate in this zone if the Exception Test is passed

FRA requirements.

All development proposals in this zone should be accompanied by a FRA. See Annex E (of PPS25) for minimum requirements

Policy Aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques.

Zone 3a: High Probability

Definition

This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) and a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Appropriate uses

The water-compatible and less vulnerable uses of land listed in Table D.2 (of PPS25 and Table A-2 of this report) are appropriate in this zone.

The highly vulnerable uses listed in Table D.2 (of PPS25 and Table A-2 of this report) should not be permitted in this zone.

The more vulnerable and essential infrastructure listed in the Table D.2 (of PPS25 and Table B-2 of this report) should only be permitted in this zone if the Exception Test is passed. Essential Infrastructure permitted in this zone should be designed and constructed to remain operational and safe for user in times of flood.

FRA requirements

All development proposals in this zone should be accompanied by a FRA, See Annex E (of PPS25) for minimum requirements.

Policy Aims

In this zone, developers and local authorities should seek opportunities to:

i. reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;

ii. relocate existing development to land in lower Flood Zones; and

iii. Create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocation and safeguarding open space for flood storage.

Zone 3b: The Functional Floodplain

Definition

This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).

Appropriate uses

Only the water-compatible uses and the essential infrastructure listed in Table D.2 that has to be there should be permitted in this zone. It should be designate and constructed to:

- Remain operational and safe for users in times of flood;
- Result in no net loss of floodplain storage;
- Not impede water flows; and
- Not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception test.

FRA requirements

All development proposed in this zone should be accompanied by a FRA. See Annex E for minimum requirements.

Policy Aims

In this zone, developers and local authorities should seek opportunities to:

i. Reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and

ii. Relocate existing development to land with a lower probability of flooding.

Appendix F: - Flood Risk Vulnerability Classification

F.1 FLOOD RISK VULNERABILITY CLASSIFICATION

Flood risk vulnerability classifications are provided in Table D.2 of PPS25. These provide recognition that not all land uses have the same vulnerability to flooding. Some land uses such as residential developments are more vulnerable to the potential loss of life and damage to personal property and possessions than, for example, shops and offices. Five flood risk vulnerability classifications are contained in PPS25 and these are:

- Essential infrastructure
- Highly vulnerable
- More vulnerable
- Less vulnerable
- Water compatible development.

Flood Zone 1 – Low Probability

From a flood risk perspective all land uses are acceptable within Flood Zone 1. Flood risk is not considered to be a significant constraint to development and all land uses listed below are appropriate in this zone.

- Essential infrastructure
- Highly vulnerable
- More vulnerable
- Less vulnerable
- Water compatible development.

A Screening Study, as per PPS25 Practice Guide, will be required for development in this zone – this will determine whether further assessment of flood risk is required. This will take account of historical flood records of localised flooding, site specific considerations and the surface water proposals for the development, including mitigation.

However, due to their potential impact on the local flood risk, a full Flood Risk Assessment will be required for all developments greater than 1ha in size. This will include further consideration of surface water drainage and onsite mitigation measures that may be required, particularly where the capacity of the surface water sewer or receiving watercourse is limited. This assessment will be undertaken by the developer of the site and should be appropriate to the scale, nature and location of the development. The Council's Drainage Engineers and the Environment Agency will be able to advise potential developers as to their specific requirements on a site by site basis.

Flood Zone 2 – Medium Probability

Subject to the application of the Sequential Flood Risk Test, PPS25 specifies suitable types of development in Flood Zone 2 as:

- Essential infrastructure
- More vulnerable
- Less vulnerable
- Water compatible development.

Highly vulnerable uses should only be permitted in this zone if the Exception Test is passed. The SFRA is unable to assess whether the site will pass parts a) and b) of the Exception Test. However, the council must be able to demonstrate the need for development through the spatial planning process.

A Flood Risk Assessment will be required for all development in this zone. The Flood Risk Assessment will need to assess the current level of flood risk as well as the level of flood risk

following development. Development plans for the site will need to demonstrate that flood risk can be effectively and safely managed without increasing flood risk elsewhere.

Proposals will also need to demonstrate that access and egress to the development can be maintained during an extreme flood event and that development is set at an appropriate level. A further level of analysis may be required where development is planned behind or adjacent to existing defences in order to test the sustainability and robustness of the mitigation measures. In keeping with Flood Zone 1 other flood risk constraints, such as incidents of localised flooding and other site specific considerations will need to be addressed. Again, detailed FRAs will be undertaken by the developer of the site and the Environment Agency will be able to advise potential developers as to their specific requirements on a site by site basis. The Flood Risk Assessment will need to address part c) of the Exception Test and should only be commenced when the planning justification is clearly established.

Flood Zone 3 – High Probability

A Sequential Flood Risk Test is used to prioritise sites in order of vulnerability to flood risk and their acceptability for development. Developers should primarily focus on lower Flood Zones in preference to Flood Zone 3. Any proposals for development within Flood Zone 3 will require developers to undertake a detailed Flood Risk Assessment. It should be noted that constraints to development are likely to be significant and developers should seek advice from the Councils and the Environment Agency as to the specific requirements for assessment.

Flood Zone 3 is subdivided into Zones 3a and 3b. Flood Zone 3b is the portion of floodplain that provides natural and/or managed attenuation. It can be all or part of the flow area and owing to the frequency of inundation, Zone 3b areas are considered to be Functional Floodplain. Urban areas are generally considered to be Zone 3a, so for the purpose of this SFRA, Brownfield sites will be assumed Zone 3a.

Zone 3a is potentially suitable for water compatible and less vulnerable land uses. The more vulnerable and essential infrastructure uses should only be permitted in this zone if the Exception Test is passed. Highly vulnerable development should not be permitted in this zone.

In Zone 3b, only essential infrastructure (subject to exception testing) and water-compatible uses may be permitted.

Where sites are partially located within Flood Zone 3b, it is recommended that Councils should avoid development by specifying water compatible uses or Public Open Space for these areas.

Land use vulnerability classifications and flood zones are carried forward into Table D.3 for application of the Exception Test.

Proposed Updates to PPS25 Vulnerability Classification

On 11 August 2009, CLG published a Consultation Paper on proposed amendments to PPS25. The consultation relates to proposed clarifications to some aspects of the existing national spatial planning policy on development and flood risk, to help ensure the policy is applied effectively. The consultation process is due to end in November 2009.

There are four amendments proposed in Table D.2 including:

1. Moving water treatment and sewage treatment works from 'less vulnerable' to 'essential infrastructure'. This means they will now need to pass the Exception Test if planned in Flood Zone 3a rather than just Flood Zone 3b. As usual, they will have to be designed to the appropriate uses and policy aims within Table D.1
2. Allowing police, ambulance and fire stations to be defined as 'less vulnerable' only if they are **not** required to be operational during flooding. This will stop the exclusion of new emergency services facilities from communities they service in high flood risk areas.
3. To allow facilities requiring hazardous substances consent, which are required to be located in flood risk areas, due to their need to be co-located with other facilities (i.e. the need to be located near ports, or processed or manufactured facilities) to be defined as 'essential infrastructure' rather than 'highly vulnerable'
4. Adding wind turbines to the 'essential infrastructure' category. However, in keeping with PPS25, the Sequential Test is not required but Parts A) and C) of the Exception Test would need to be passed if located in Flood Zone 3a and 3b.

Until the proposed changes have been agreed and PPS25 updated, the current PPS25 (2006) and its Practice Guide (2009) should be used for planning policy guidance, but users should be aware of possible future changes.

Classification	Description
Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.
Highly Vulnerable	• Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent (1)
More Vulnerable	• Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste. (2) • Sites used for holiday or short-let caravans and camping, subject to a specific warming and evacuation plan
Less Vulnerable	• Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non–residential institutions not included in 'more vulnerable'; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment plants. • Sewage treatment plants (if adequate pollution control measures are in place).
Water-compatible Development	• Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel workings. • Docks, marinas and wharves. • Navigation facilities. • MOD defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.
Note 1: This classification is based on advice from the Environment Agency on the flood risks to people and the need of some uses to keep functioning during flooding. Note 2: Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood sensitivity. (1)DETA Circular 04/00 – para. 18: Planning controls for hazardous substances. (2)See Planning for Sustainable Waste Management: Companion Guide to Planning Policy Statement 10 for definition.	

Appendix G: - SUSTAINABLE URBAN DRAINAGE SYSTEMS

G.1 SUSTAINABLE URBAN DRAINAGE SYSTEMS

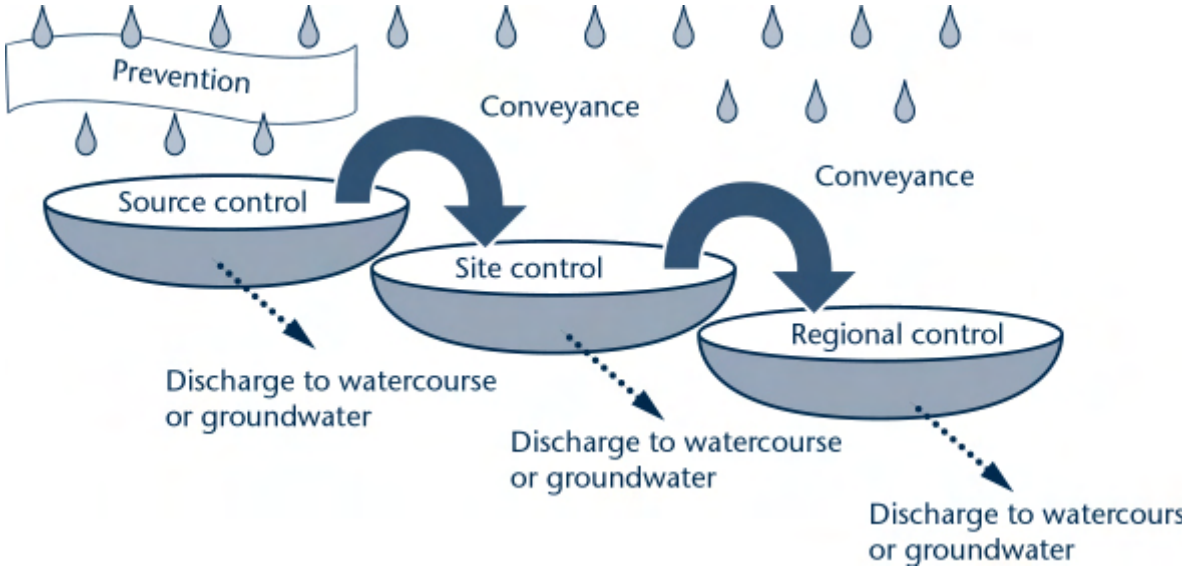
G.1.1 Sustainable Drainage Systems

Sustainable Urban Drainage Systems (SUDS) are management practices which enable surface water to be drained in a more sustainable manner.

For Greenfield developments, the aim is to not increase runoff from the undeveloped situation; for Brownfield re-developments, the aim is to reduce existing runoff rates. Wherever possible, this should be achieved through the implementation of a sustainable drainage or flow retention system, constructed within the boundaries of the development site.

There are many different SUDS techniques which can be implemented. As a result, there is no one correct drainage solution for a site. In most cases, a combination of techniques, using the Management Train principle, will be required. Figure G1 shows the SUDS Management Train principle, where source control is the primary aim.

Figure G1: SUDS Management Train principle[24]



Regarding flood risk, those SUDS with a high/primary process for dealing with water quantity should first be investigated, before other benefits such as water quality and environmental befits are included. SUDS can reduce the amount and rate of runoff by a combination of:

- Infiltration;
- Storage; and
- Conveyance

There are a number of SUDS techniques which could be used individually or as part of a management train, however their suitability relies on the site and catchment descriptors discussed above but also their intended purpose (as shown in Table G1).

Table G1: Suitability of SUDS techniques

[24] CIRIA (2008) Sustainable Drainage Systems: promoting good practice – a CIRIA initiative

SUDS Technique	Infiltration	Storage	Conveyance
Green Roofs	×	✓	✓
Permeable Paving	✓	×	✓
Rainwater Harvesting	×	✓	×
Swales	✓	✓	✓
Detention Basins	✓	✓	✓
Ponds	×	✓	✓
Wetlands	×	✓	✓

Source: PPS25 Practice Guide

PPS25 stresses that Regional Planning Bodies and LPAs should:

- Promote the use of SUDS for the management of run-off
- Ensure their policies and decisions on applications support and complement the Building Regulations on sustainable rainwater drainage, giving priority to infiltration over first watercourses then sewers
- Incorporate favourable policies within Regional Spatial Strategies
- Adopt policies for incorporating SUDS requirements in Local Development Documents
- Encourage developers to utilise SUDS wherever practicable, if necessary through the use of appropriate planning conditions
- Develop joint strategies with sewerage undertakers and the Environment Agency to further encourage the use of SUDS

The Greater Manchester sub-regional SFRA has produced a SUDS Suitability Map and accompanying report which is an excellent source of information. It should however be used as a very high level piece of information at the beginning of any discussions regarding the use of SUDS within a community. It does not preclude the need for site-specific investigations on the suitability of SUDS within a development site.